TOOLING & PRODUCTION Magazine

SEPTEMBER 1958

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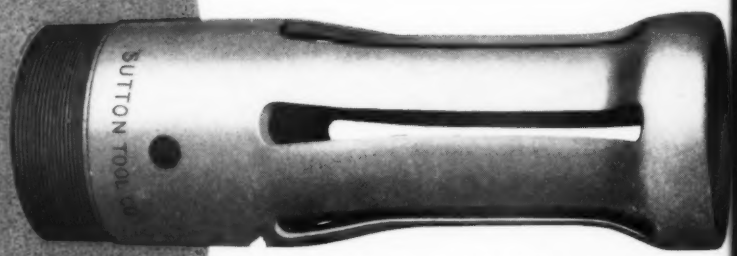
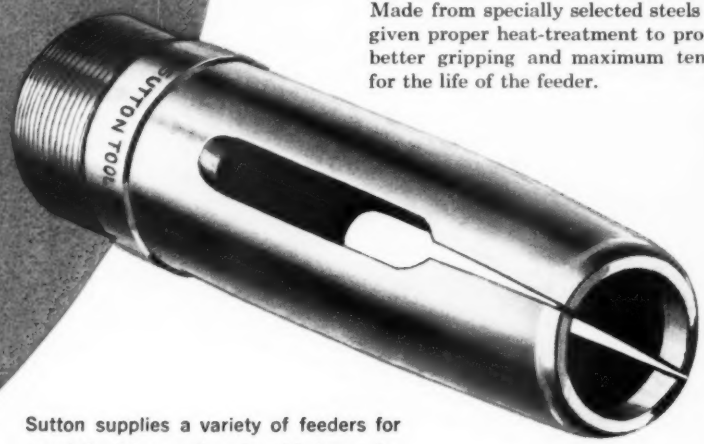
3 best friends of an automatic bar machine

Style "L" Master Feeder—Interchangeable and replaceable pads seated in recess, with lug engaging a slot in the master to keep pads from rotating. No pins or screws. Style "L" handles stock practically up to machine capacity.

Super Cage-type Feeder — Advantageous for short runs. Tension easily adjusted simply by tapping with hammer since multiple grips act as springs. Handles round, hexagon or square stock. Available in non-marring bronze.



Conventional Solid Feeder — Manufactured according to the dimensional specifications of Machine Tool Builders. Made from specially selected steels and given proper heat-treatment to provide better gripping and maximum tension for the life of the feeder.



These three feeders are the old reliables! 90% of all bar machine operations are performed with them! That's why it's important to use Sutton feeders. Sutton specializes in these three types—steel to exacting requirements, uniformity of tension, immediate deliveries from stock.

Sutton supplies a variety of feeders for specialized types of work; odd shapes for special extruded stock, combination feeders and feeder tubes for over-size stock. Call on Sutton for designing, engineering and manufacturing!

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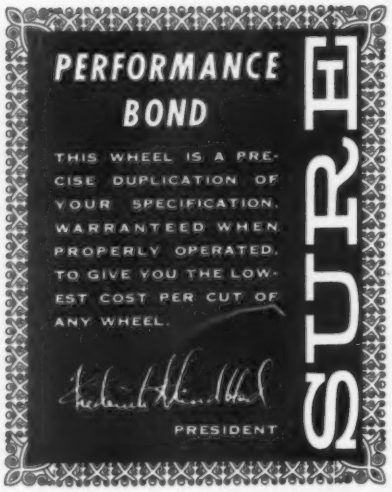
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CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

SEPTEMBER 1958
VOL. XXIV No. 6
GEORGE J. HUEBNER, Founder

PERSONALLY SPEAKING

Dear T&P Reader:

Do you have a group of associates with whom you frequently eat lunch? Our organization is very compatible that way and, of course, these noon day sessions are productive of some very interesting conversation and ideas. Quite recently, the automobile business was the main topic of conversation. In fact, the automobile business comes in for a large share of table talk, as well it might because about the only thing that we have more of in this country than automobiles is people.

The conversation, on the particular day I'm recalling, centered around trading practices. We talked about "the good old days" when a few people practiced the deception of filling a transmission with ground cork and hamburger to quiet the gears long enough either to trade the car off or to sell it to some unsuspecting amateur.

Then we got to talking about the present deceptive practice of altering speedometer mileage. From my observation, I'm convinced that there is no point in looking at the mileage on the speedometer of a used car because, whatever it reads, it probably isn't right. Mileage is a criterion of value. Of course, there are many other criteria. But, true mileage provides a definite clue to many points for consideration in purchase of an automobile.

For many years, we have had bureaus of weights and measures whose business it has been to make sure that gasoline pumps deliver full gallons and butchers' scales full pounds. There are many other important checks and balances from which we benefit through the bureaus of weights and measures. None of us would knowingly permit short delivery of gasoline nor would we pay for overweight on a piece of meat caused by the butcher's thumb on the scale. There are certainly millions of people who buy automobiles without the protection of honest mileage readings.

Our gang at lunch came to the conclusion that speedometers should be made to read in hundreds of thousands of miles instead of only tens of thousands. Also, the mileage recording part of the speedometer, the odometer, should be sealed by the manufacturer and that seal should be inviolate. We concluded that the breaking of that seal for any reason should become a part of the title record of the car. If a program like this were followed, then mileage records would take on real significance, a dealer's guarantee of mileage on a car would mean something in selling it, and when a dealer would be trading for a car the mileage reading would be significant because the dealer would not be deceived by the customer.

The automobile industry is so much a part of the lives of all of us that it would seem to be good sense to set up a program to accomplish the purpose of making a speedometer mileage reading significant. I can't see how anybody could ethically be opposed to doing this.

Cordially yours,

Ray Huebner

Publisher

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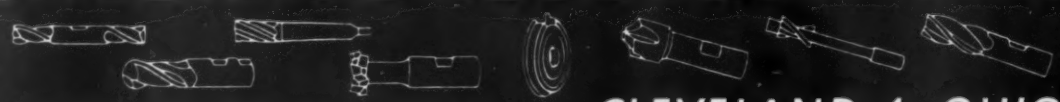

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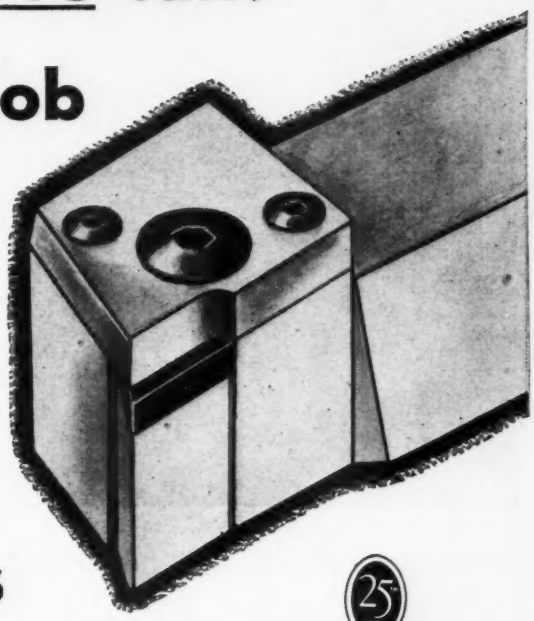
Any cutting job is easier when you rely on V-R carbides



COMPLETE LINE OF CARBIDE, CERAMIC AND TANTUNG® CAST ALLOY CUTTING® TOOLS.

Engineered by production men to solve production problems

It's the carbide that cuts . . . and solving cutting problems becomes a simple matter of engineering the V-R carbide for the job. V-R Production Engineers have worked with thousands of cutting problems and developed carbides for maximum cutting efficiency in practically any application.

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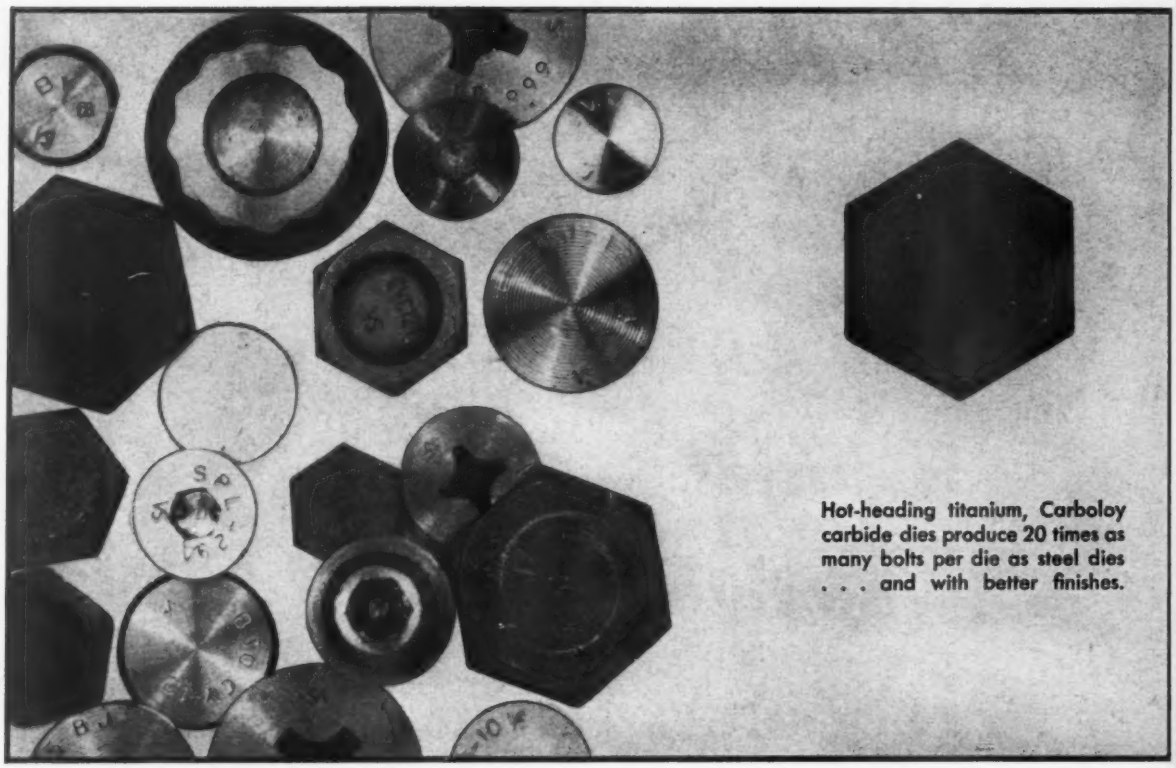

Hot-heading titanium, Carboloy carbide dies produce 20 times as many bolts per die as steel dies . . . and with better finishes.

Outwear steel dies, give better finish, and . . .

CARBOLOY® CARBIDE DIES, HOT-HEADING TITANIUM, TURN OUT 20 TIMES AS MANY BOLTS PER DIE

Carboloy cemented carbide is harder and more wear-resistant than steel—and it retains these properties at extremely high temperatures. That's why carbide-equipped dies, used in hot-heading titanium bolts at Voi-Shan Mfg. Co., Culver City, Calif., boosted die output to 20 times the amount obtained with steel dies.

Hot-heading improves the physical properties of titanium bolts. So, blanks are pre-heated to about 1500° F. before they're placed in the 60-ton hydraulic press. Steel dies couldn't take the heat . . . they broke down quickly, especially on the inside radius. Also, galling was a problem because of titanium's affinity to steel.

By switching to Carboloy carbide dies, Voi-Shan produces up to 100,000 small-diameter bolts per die before any sign of wear, compared with only 5000 for steel dies. And, with carbide dies, each bolt has a better finish and more uniform size.

Carboloy carbide-equipped dies give similar performance in cold-heading, drawing, cold-extruding, forming, or blanking. Your die-maker can tell you more about the cost saving advantages of Carboloy carbide dies. For additional information—or a copy of the new Carboloy Die Engineering Manual—write: *Metallurgical Products Dept. of General Electric Company, 11111 E. 8 Mile Street, Detroit 32, Mich.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

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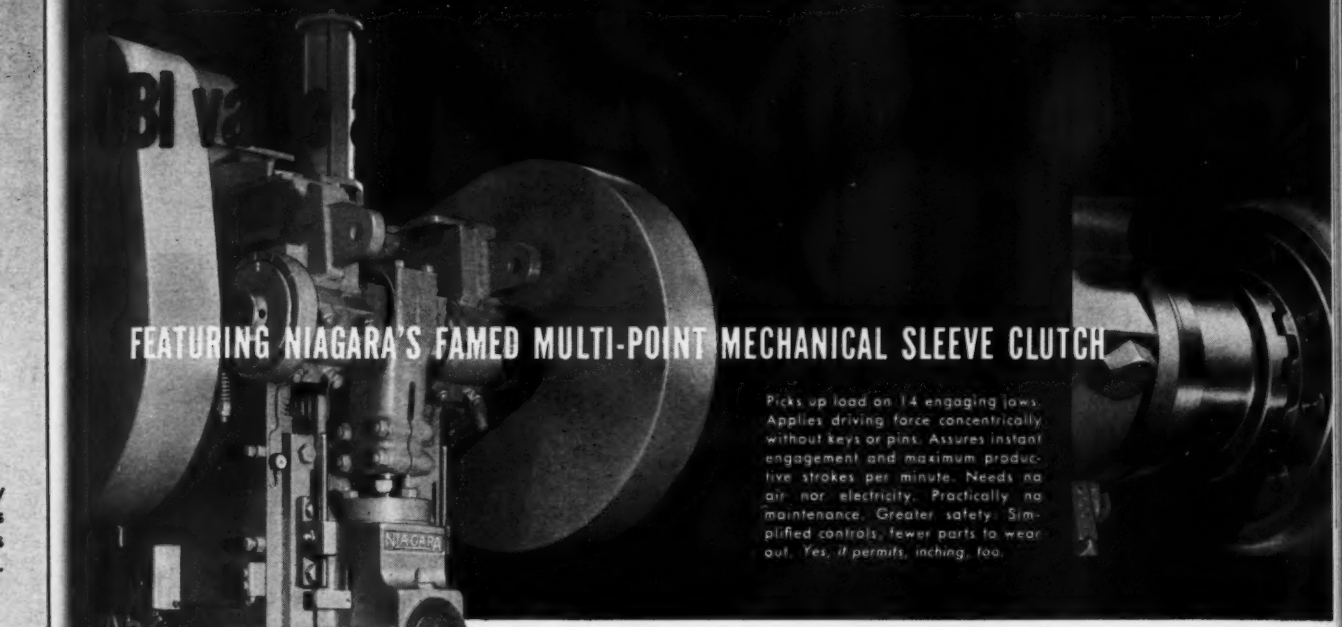
TON FOR TON . . . DOLLAR FOR DOLLAR



FEATURING NIAGARA'S FAMED MULTI-POINT MECHANICAL SLEEVE CLUTCH

Picks up load on 14 engaging jaws. Applies driving force concentrically without keys or pins. Assures instant engagement and maximum productive strokes per minute. Needs no air nor electricity. Practically no maintenance. Greater safety. Simplified controls, fewer parts to wear out. *Yes, it permits, inching, too.*

1¼ - 6½ inch shaft diameters

5½ - 150 ton capacities

Here's a workhorse that's known for setting the pace on the most demanding jobs... jobs where the clutch is engaged and disengaged at every press stroke... jobs that call for operation three shifts a day, day in and day out.

Built and *backed* by a company which produces industry's greatest variety of inclinables*, Series A Presses have amassed an unusual success record in thousands of applications. To be specific, let's take a close look at a Series A user:

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WITHOUT ONE CENT SPENT ON CLUTCH ENGAGING SURFACES

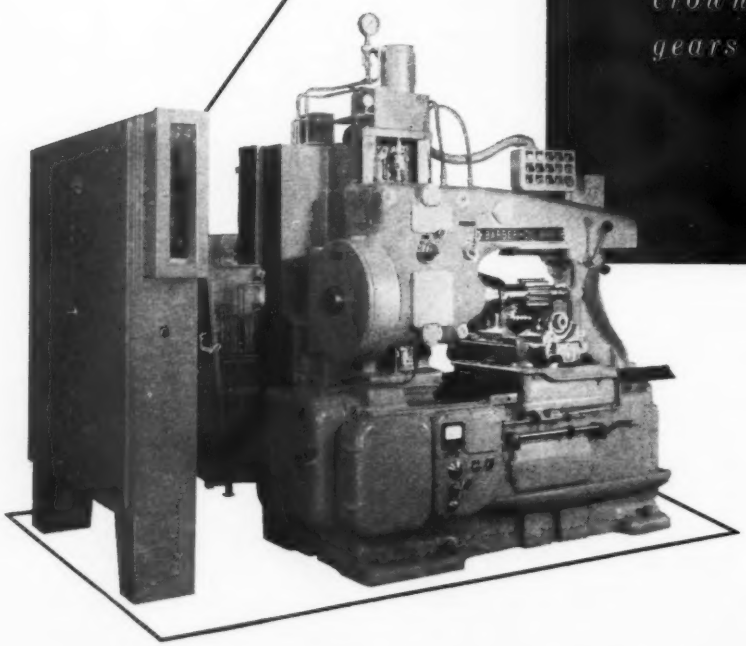
GET THE FULL REPORT

NIAGARA

crown hobbing

with automatic cycle selection

saves time and cost in producing accurately crowned gears



Fairfield Manufacturing Company, LaFayette, Indiana, is crown-hobbing coarse pitch pinions on this special Barber-Colman No. 14-15 Hobbing Machine. Crown-hobbing is a new method for generating crowned gear teeth. Whether shaving is required after crown-hobbing depends solely upon the finish required. If the hobbed finish is satisfactory, shaving can be eliminated. If shaving is required to produce the desired finish, crown-hobbing allows uniform stock removal by the shaving cutter, resulting in reduced production time and increased shaving cutter life.

This machine, especially designed and built for crown-hobbing, may also be used for standard gear hobbing. A choice of automatic cycles is available through settings on the control panel, including hobbing at constant depth and finish crown-hobbing, rough and finish hobbing without a crown, or single cut hobbing with or without a crown, feeding either left or right with climb or conventional cutting.

On the job shown here, Fairfield Manufacturing Company is crown-hobbing 3 D.P. pinions, 14T, 20° P.A., with 5½″ face and .008″ change in tooth thickness. The automatic cycle includes rough hobbing at constant depth and finish crown-hobbing. In cycling, the machine completes the conventional roughing cut, work slide raises, hob returns to starting position, and work slide lowers to finished depth against the crowning cam. The gear is crown-hobbed at a constantly changing depth, as controlled by the crowning cam, work slide raises, hob returns to starting position, and cycle stops for reloading. Cycle pattern and type of feed are selected by levers on the control panel as shown.

The machine may be designed to suit special job requirements, either as a single-purpose machine, or with the universal feature, as in this case, for both crown and standard gear hobbing. A cam and change gear mechanism for crown-hobbing is provided in the design of the machine for raising and lowering the work slide during the cycle to produce a change in tooth thickness. The work slide is held against the rotary cam by hydraulic pressure in addition to its own weight. Change gears are provided in the cam drive so that different amounts of change in tooth thickness can be produced with the same cam. Different cams can be designed when a different tooth crown configuration is required.

Crown-hobbing also makes it possible to hold a change in tooth thickness within the desired limits, and the tooth bearing can be located at the most desirable point consistent with job conditions.

We welcome your inquiries on crown-hobbing and suggest you send us drawings of your crowned-gears. Our engineers will analyze the job conditions and make recommendations for crown-hobbing. If analysis shows a practical application for crown-hobbing, we shall be glad to cut samples in our laboratory for your approval.

BARBER-COLMAN COMPANY

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Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

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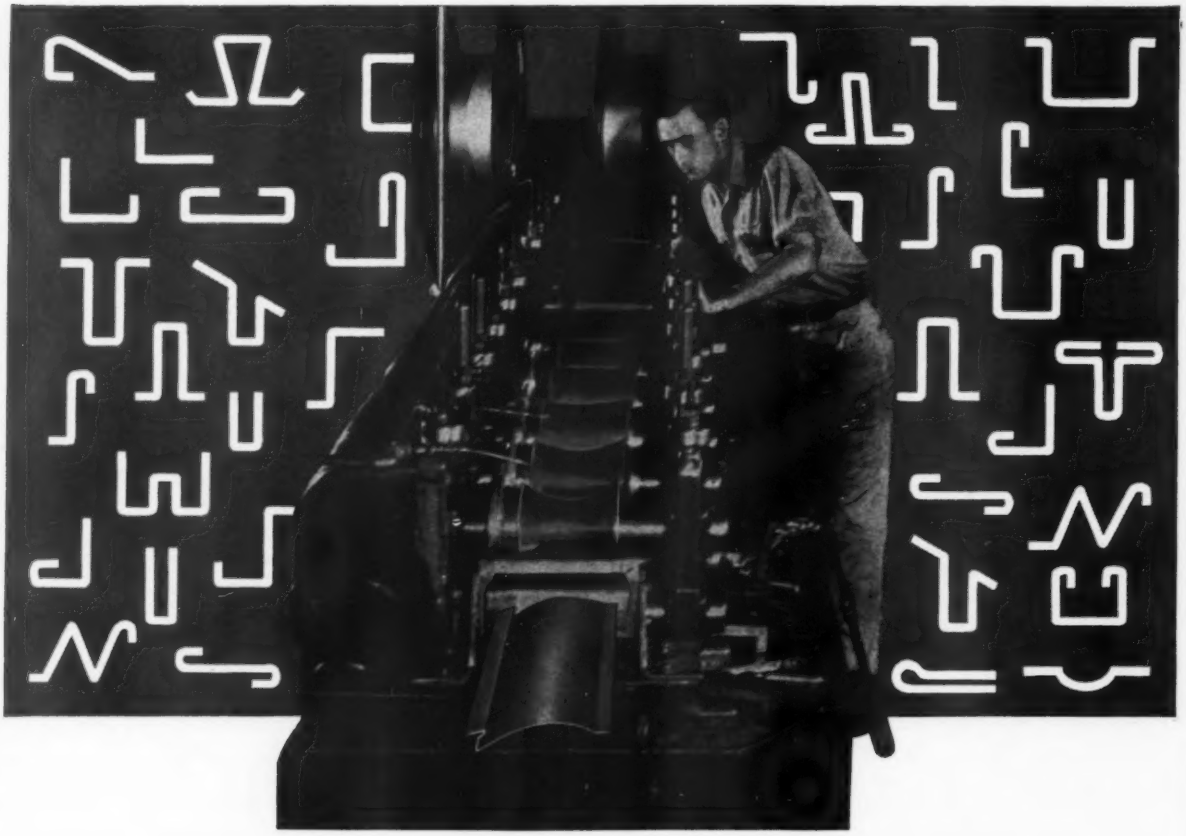

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"Commendable Comments"

". . . Being against Communism is not enough in itself; we must have an affirmative position from which to appeal to the people in all parts of the world who are struggling to improve conditions in their countries. That position is our economic system, and the best proof of its worth that we can offer to the world is that it works. The major significance of the newest Soviet satellite is that it is evidence of what the Russian system can produce; we must show the world that we can offer economic progress with freedom."

—Richard M. Nixon, Vice President of the United States, addressing panel of corporation executives at AMA Special Economic Mobilization Conference in New York.

". . . The integrated line is a system for manufacturing parts. It is a combination of conventional machine tools and material handling equipment with an over-all automatic control system. The integrated line is for the man faced with the problem of producing more, or producing better, or producing cheaper, who can't wait for the development of a complete new process or a complete new automatic factory. He is the man who cannot spend large sums of money to get his automatic factory. He has to do the best with what he has and he has a definite production deadline to meet. He may want to use many of the pieces of equipment already on his floor. This is the man the integrated line is designed to satisfy."

—Don A. Cargill, president, Cargill Detroit Corporation speaking at the ASTE Tool Show in Philadelphia.

"The length of life of machinery today is determined by the pace of technological progress—not by the length of time it takes to tire out a piece of iron. You may have to scrap your machines because new ones are more efficient or because your product has changed so much the old machine won't do the job. So, under present conditions, you have to write off the cost of most equipment much faster than you did 20 years ago. Government officials are beginning to recognize this new situation, but they are a long way as yet from giving it realistic consideration in their tax decisions."

—L. L. Colbert, president, Chrysler Corp., addressing The Citadel, The Military College of South Carolina at Charleston.

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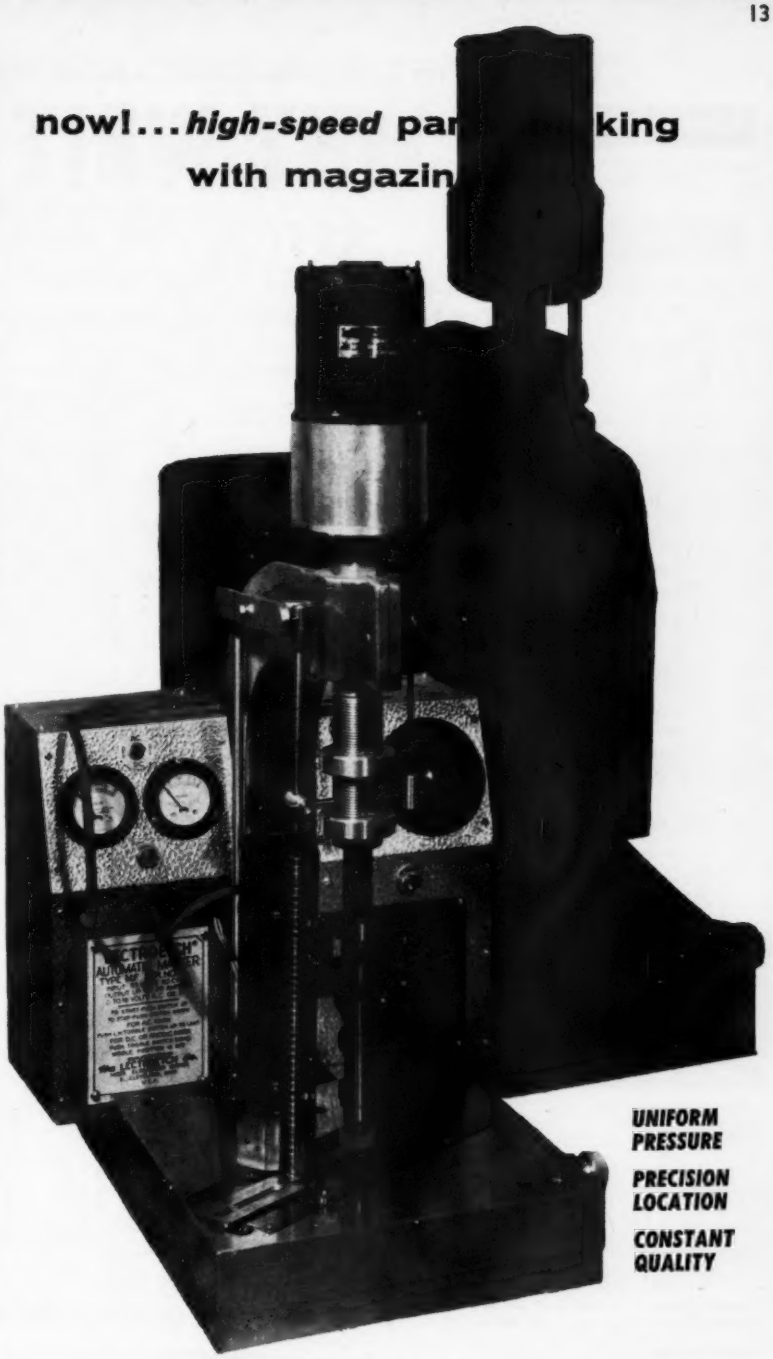
with magazin



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RIGHT HAND TAPS, DIES AND THREAD PLUG GAGES

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00	90-96-112
0	56-64-72
1	56
2	60-72
3	48-56-64
4	32-36-42-44-56-60-64-72-80-90
5	30-32-36-38-40-50-56-60-64-80
6	30-36-38-42-44-48-56-60-64
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19/32	12-18-20-24-32-40
5/8	9-10-12-13-14-16-20-24-26-27-28-30-32-36-40-56
41/64	11-18-24
21/32	10-11-18-20-24-27-32-40
21/16	20-.004
11/16	11-12-14-16-18-20-24-27-28-30-32-36-40
23/32	11-16-20-27-32-36-40
47/64	10-16
3/4	9-11-12-14-15-18-20-22-24-26-27-28-32-36-40
49/64	10-16
25/32	10-16-20-27-32-40
.800	16
13/16	8-10-12-14-16-18-20-24-27-28-32-40
27/32	10-18-20-27-32-40-48
.850	14
7/8	8-10-11-12-13-16-18-20-24-26-27-28-32-36-40
29/32	9-12-14-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-27-28-32-40
31/32	9-16-20-28-32
1	5-9-10-11-12-16-18-20-24-26-27-28-30-32-36-40-48
1-1/32	8-12-14-16-18-20
1-3/64	14
1-1/16	8-10-12-14-16-17-18-20-24-27-28-32-40
1-3/32	8-9-12-14-16-18-20
1-1/8	8-10-14-16-18-20-24-27-32-40
1-5/32	7-12-14-18-20-24-26-32-40
1-3/16	7-8-10-12-14-16-18-20-24-32-40
1-1/4	8-10-14-16-18-20-24-28-32-40
1-5/16	6-7-8-10-12-14-16-18-20-24-32-40-48
1-3/8	8-10-14-16-18-20-24-32-40
1-13/32	28
1-7/16	6-8-10-12-14-16-18-20-24-28-32-40
1-1/2	7-8-10-13-14-16-18-20-24-28-32-40
1-17/32	7-12-18
1-9/16	12-14-16-18-20-24-32-40
1-5/8	5½-8-10-11½-12-13-14-16-18-20-24-28-32-40
1-11/16	10-12-14-16-18-20-24-32
1-23/32	5
1-3/4	5-6-8-10-12-13-14-16-18-20-24-28-32-40
1.767	18
1.7715	12
1-13/16	8-10-12-14-16-18-20-24-32
1-7/8	5-8-10-12-14-16-18-20-24-32
1-29/32	18-32
1-15/16	8-10-12-14-16-18-20-24-32
2	4½-6-8-10-12-14-16-18-20-24-28-32
2-1/16	12-14-16-18-20-24-32
2-1/8	4½-8-10-12-14-16-18-20
2-3/16	12-16-20
2-1/4	4½-8-10-12-14-16-18-20-24
2-5/16	12-16-18-30
2.340	18
2-3/8	4-8-10-12-14-16-18-20-32
2-7/16	12-16-20
2-1/2	4-6-8-10-12-14-16-18-20
2-9/16	12-16-18
2-5/8	8-10-12-14-16-20
2-11/16	12-16
2-3/4	4-8-10-12-14-16-18-20-32
2-7/8	4-8-10-12-16-18-20-32
2-15/16	12-16
3	3½-4-8-10-12-16-18
3-1/8	4-8-12-16-20
3-3/16	20
3-1/4	4-8-10-12-14-16-18
3-3/8	4-8-10-12-16
3-1/2	4-8-10-12-16
3-3/4	4-8-10-12-16
4	4-8-10-12
4-1/8	4-8-10-12
4-1/4	4-8-10-12

Many more sizes in stock up to 6" dia.

LEFT HAND TAPS, DIES AND THREAD PLUG GAGES

Size	Threads Per Inch
0	80
1	56-64-72
2	56-64
3	48-56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-32-40
12	24-28-32-40
14	20-24
5/32	36
3/16	32-40
1/4	20-23-24-25-27-28-32-40-48
.277	40
5/16	18-20-24-27-28-32-40
11/32	24
3/8	16-20-24-27-32-40
13/32	20
7/16	14-20-24-27-28-32-40
1/2	12-13-14-16-20-24-27-28-32-40
9/16	12-18-20-24-27-32-40
.622	8
5/8	10-11-12-16-18-20-24-28-32
11/16	11-12-16-18-20-24-32
.720	8
3/4	9-10-12-16-18-20-24-32
13/16	10-16-18-20
7/8	9-10-12-14-16-18-20-24-32
15/16	12-14-16-18-20-24-32
1	8-12-14-16-18-20-24-28-32
1-1/8	7-12-18-20-24-32
1-1/4	6-7-8-12-14-16-18-20
1-5/16	12-14-16-18-20
1-3/8	5-6-8-10-12-16-18-20-24
1-7/16	10-12-18
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	5½-6-8-10-12-16-18-20
1-11/16	8-10-12-16-18-20-24
1-3/4	5-8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	5-8-10-12-14-16-18-20
1-15/16	8-12-16-18
2	4½-8-10-12
2.215	20
2-7/32	20
2-1/4	4½-8-12
2-5/16	24
2-½	4-8-12
2-11/16	16
2-3/4	4-12
2-7/8	24
3	4-8
3½	11

RIGHT HAND—UNLISTED "GUN" OR SPIRAL POINTED TAPS

Size	Threads per Inch	Size	Threads per Inch
0	80 NF		
		⅜	9 NC, 14 NF
1	56 NS	1	8 NC, 12-14 NF
2	56 NC, 64 NF		
9/16	12 NC, 18 NF	1⅛	7 NC, 12 NF
⅝	11 NC, 18 NF	1¼	7 NC, 12 NF
11/16	11 NS, 16 NS	1⅜	6 NC, 12 NF
¾	10 NC, 16 NF	1½	6 NC, 12 NF

RIGHT HAND—UNLISTED "PULLEY" OR EXTRA LENGTH TAPS

Size	Threads per Inch	Size	Threads per Inch
4	40 NC, 48 NF	⅝	24 NF
5	40 NC, 44 NF	7/16	20 NF
6	32 NC, 40 NF	½	20 NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	9/16	18 NF
12	24 NC, 28 NF	⅝	18 NF
¼	28 NF	⅝	16 NF
5/16	24 NF	Also Larger Sizes NC & NF	

RIGHT HAND "PIPE" TAPS

TAPER "NPT" Size	TAPER "NPT" Thread	STRAIGHT "NPS" Size	STRAIGHT "NPS" Thread	EX. LENGTHS TAPER "NPT" Size	EX. LENGTHS TAPER "NPT" Thread
1/16	27	1/16	27	1/16	27
⅛	27	1	8	⅛	27
2½	8	1½	11½	¼	18
3	8	2	11½	⅜	18
3½	8	2½	8	½	14
4	8	3	8	¾	14
Also British		3½	8	1	11½
		4	8		
		Also British			

LEFT HAND 'PIPE TAPS' TAPER AND STRAIGHT

Size	Thread	Size	Thread
1/16	27	1	11½
⅛	27	1⅛	11½
¼	18	1¼	11½
⅜	18	2	11½
½	14	2½	8
¾	14	3	8

"OVERSIZE TAPS"

RIGHT HAND N. C. and N. F. SIZES
MACHINE SCREW No. 2 TO No. 5
PLUS .002 TO .003
MACHINE SCREW No. 6 TO No. 14
PLUS .003, .005, .010
FRACTIONAL ¼" TO 1½"
PLUS .003, .005, .010 AND .015

"UNDERSIZE ALSO AVAILABLE"

"PRICES OF SPECIALS ARE GOVERNED BY QUANTITY ORDERED" PRICES QUOTED UPON REQUEST

REGULAR LISTED SIZE TAPS AND TOOLS IN STOCK FOR IMMEDIATE DELIVERY

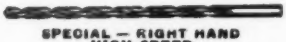
ACME TAPS
AVAILABLE FOR QUICK DELIVERY

2 WEEKS DELIVERY—When ordering or requesting quotations, kindly furnish us with the following information:

(a) Kind of material being machined.
(b) Depth of hole, through or bottom.
(c) Tap to be used horizontally or vertically.
(d) Will tap turn, or is piece expected to be turned.
(e) Is tapping job expected to be done in one pass.
(f) Would tap be backed out of hole, or machine stopped for release of tap.
(g) If possible, submit thread length, and overall length of tap desired with a blue print.

SPECIAL REAMERS
IMMEDIATE DELIVERY

H.S.S.S. MACHINE REAMERS
DECIMAL, FRACTIONAL, LETTER, AND WIRE GAUGE SIZES
Prices On Application
Write for Our Stock List



SPECIAL — RIGHT HAND HIGH SPEED "EXTRA LENGTH DRILLS" In Stock for Immediate Delivery

WE ARE WELL EQUIPPED TO SUPPLY YOUR NEEDS IN ANY QUANTITY, PARTICULARLY WHEN YOU ARE IN A HURRY

The Largest Stock of
Special and Standard Taps, Dies, Plug Gages
RING GAGES 2 WEEKS DELIVERY

FIELD TOOL SUPPLY CO.

Industrial Cutting Tools
31 S. DES PLAINES ST., CHICAGO 6, ILL.
All Phones: Financial 6-1195

HARD GEAR HONING

CURRENT RESULTS

The following records are taken from current gear honing operations to show how some of the troublesome hazards of gear manufacturing are overcome by honing.

WHAT HONING ACCOMPLISHED

GEAR "A"

A lead error of .0008" was reduced to .0001"

GEAR "B"

Runout was improved .0020"

GEAR "C"

Notable improvement in both surface finish and in amount of tooth kickout

GEAR "D"

Variation in involute form improved .0002"

GEAR "E"

Size over pins reduced .004" and all nicks removed. Essentially a salvage job

THESE ARE THE GEARS BEING HONED

Gear	No. Teeth	Pitch Dia.	Rockwell "C"	Stock Removed	TIME	
					Honing	Floor to Floor
"A" INTERNAL	83	5.7832	58-63	.0015	40 sec.	70 sec.
"B" PLANET PINION	15	.790	56	.0005	27 sec.	31 sec.
"C" REAR SUN GEAR	45	2.3726	54	.0006	30 sec.	34 sec.
"D" REAR SUN GEAR	45	2.508	58	.001	24 sec.	30 sec.
"E" SPUR GEAR	46	6.000	60	.004		3 min. 25 sec.

NOTE: Hone Life, Gear "B"—6000 to 8500 pieces
Gear "C"—3000 to 4000 pieces

Write for Bulletin H-57-2

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING, GEAR HONING AND ELLIPTOID

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

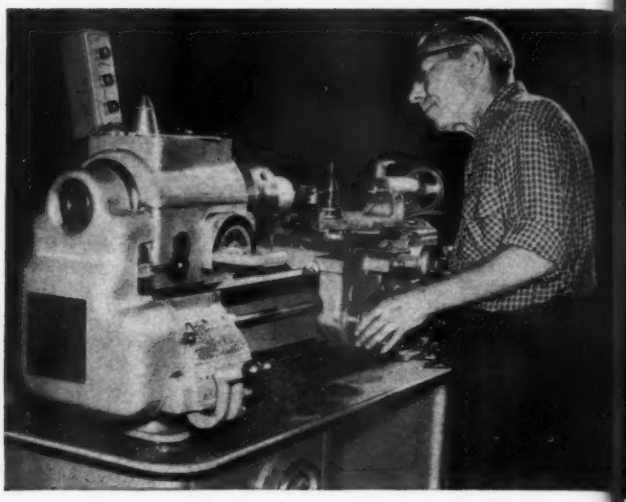
8098

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 15

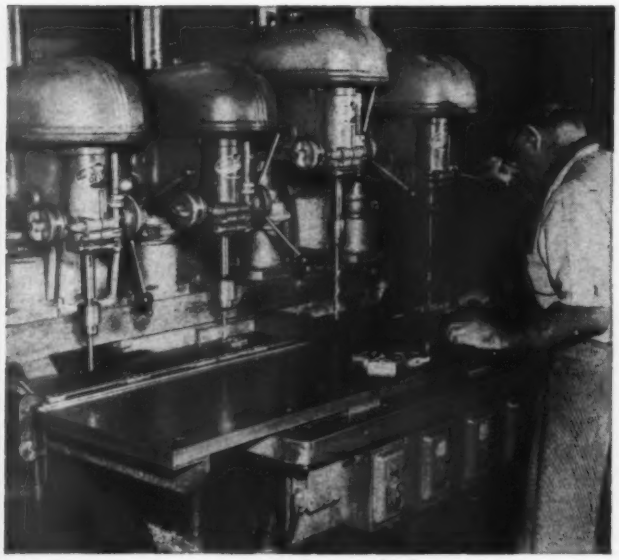
DELTA INDUSTRIAL

DELTA 20" DRILL PRESSES are built to give you machine tool production capacity with power tool flexibility. Massive construction and rugged power make the Delta 20" a heavy-duty tool. Available with hand or power feed, choice of No. 2 or No. 3 Morse taper spindle. 28 models include floor, bench, multiple spindle and overhead types. Production tables, heads and columns available as components.



DELTA 11" METAL LATHES offer exclusive Delta Quality features such as massive head stock construction, perfected variable speed drive, unique 4-position drive selector and many more. Both 4 ft. and 5 ft. bed models available with flame hardened bed. And you get the double versatility of a ram-type turret lathe, when you add production accessories for precision multiple machining jobs.

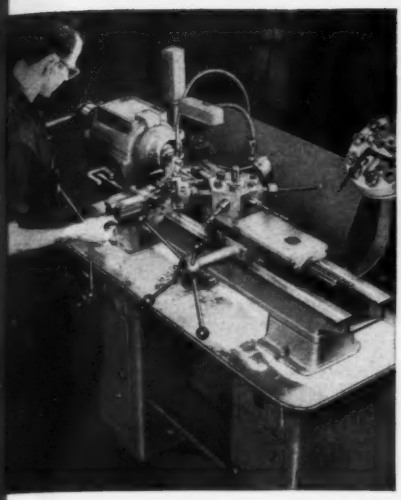
A proved way to cut your costs



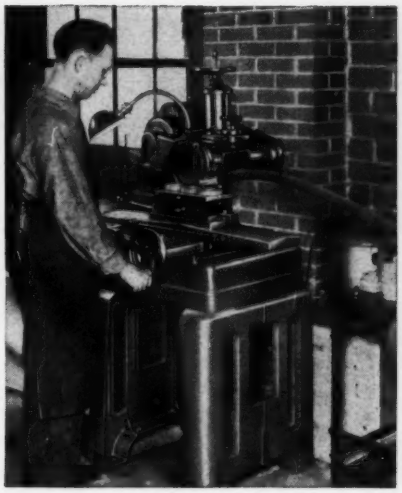
DELTA 17" DRILL PRESSES in over 70 models enable you to make your own single or multiple spindle set-up for drilling, counterboring, reaming and tapping jobs. Finest in their class, they are engineered for precision work and built for long life with low maintenance costs. Standard or power feed, high or slo speed and key chuck or tapered spindle available in floor, bench and multiple spindle models.

DELTA CUT-OFF MACHINES for fast, smooth, accurate cuts are speeding production and improving quality in tool rooms, maintenance departments and on production lines. Work head pivots for easy mitering. All belts, pulleys, cutting wheels or blades are fully enclosed for maximum safety. Whether you do wet abrasive or dry abrasive cutting, or cut non-ferrous metals or wood—you choose the model that's right for your job.

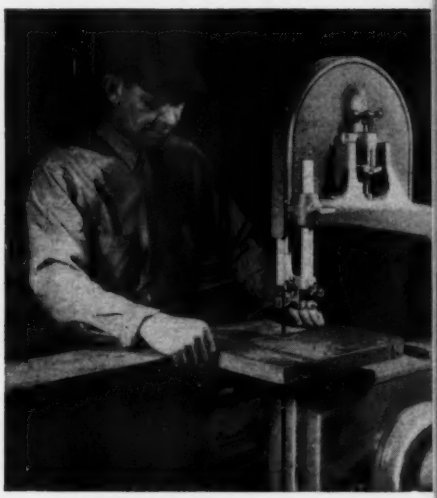
PRODUCTION TOOLING



DELTA HAND SCREW MACHINES fill the production gap between standard engine lathes and expensive, automatic screw machines . . . and at lower cost than *any* comparable machine. Bed turret, double tool post cross slide and lever type collet closer are *standard equipment*. Delta Quality features throughout assure lasting precision on multiple machining jobs.



DELTA TOOLMAKER® GRINDERS perform three precision grinding operations—surface, chip breaker and tool and cutter grinding. And with Delta 6" tool grinders, 7" standard grinders and 2½" belt grinders you have a complete line of safe, accurate, low cost grinders for *every* shop need.



DELTA 14" BAND SAWS These versatile, low cost machines give you eight cutting speeds—ranging from 40 fpm for metal to 3000 fpm for wood—using a *standard* motor. They enable you to cut stainless steel, armor plate, high speed steel, cast iron, alloy steel and dozens of other materials including woods and plastics. Available with steel or cast iron stand.

on every metalworking job

Thousands of metalworking plants across the country are cutting costs by using Delta Industrial Tools to supplement or replace expensive, special-purpose machines. Here's why: Delta tools are ruggedly built to withstand hard, continuous wear—they offer precision performance to meet the highest production standards—yet they cost less to buy, less to operate, and less to maintain. Completely portable, Delta tools can be moved in and out of production lines to relieve bottlenecks. And any plant can have inexpensive, automated operations through the combination of versatile, standard Delta components and automatic control devices.

Because Delta is the world's most *complete* line, you can choose the *right* tools for the biggest savings on *your* jobs.

Get all the facts on how YOU can cut costs with Delta Industrial Production Tooling. Write for FREE Delta Industrial Catalog to: Rockwell Manufacturing Co., Delta Power Tool Div., 622J N. Lexington Ave., Pittsburgh 8, Pa.

DELTA 15" DRILL PRESSES offer such Delta exclusives as six spindle adapters, "universal" hand feed, counterbalanced belt guard . . . plus big, machine tool ruggedness and proven production dependability. Delta 14" utility and 14" Super-Hi Sensitive Drill Presses also available in many models.

See Delta Industrial Tools at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages.

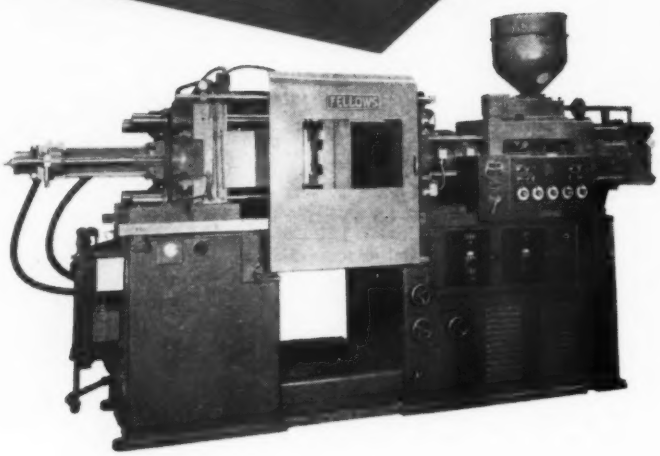
DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

CIRCLE INFORM-A-GRAM KEY NO. 17

As Automatic as you want!



FELLOWS 6-200 INJECTION MOLDING MACHINE

It's designed for versatility: attachments can be incorporated in the Fellows 6-200 to give you just the degree of automatic operation you need! A wide range of attachments permits full-automatic molding of many products that used to present problems, such as parts with internal and external threads, undercuts and side cores.

Whether you use it for partial or full-automatic molding, Fellows 6-200 pays off in increased production, fewer rejects, lower unit costs. Sensitive, dependable controls simplify set-ups and change-overs as well as operation, even on the most difficult jobs. You get dry-run speeds from 490 to 650 cycles per hour, shots up to 9 ounces with the optional pre-pack device.

Ask your Fellows representative for information about the cost-cutting Fellows 6-200 plastics injection molding machine, with or without optional attachments. (And ask him about the Fellows Plans that let you pay for your machine while it earns.) Just contact any Fellows office.

Fellows
injection molding equipment

THE FELLOWS GEAR SHAPER COMPANY, Plastics Machine Division, Head Office and Export Department: Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich. • 150 West Pleasant Ave., Maywood, N.J. • 5835 West North Ave., Chicago 39
6214 West Manchester Avenue, Los Angeles 45

CIRCLE INFORM-A-GRAM KEY NO. 18

Use a Pipe Machinery "CORRELCHEK" for faster, more accurate, and complete inspection of pipe threads (ANPT, NPTF, NPT and NGT)
Simple to operate:—
Set the instrument with Master Gages.
Check product to the proper tolerances indicated by color zones on the dial.
Torque controlled to prevent over exertion of pressure by inspectors.
Eliminate discussions and arguments.
Write today for full details.
PATENT NO. 2,833,053
THE GAGE THAT REMEMBERS
THE PIPE MACHINERY COMPANY
29100 Lakeland Blvd. • Wickliffe, Ohio
Greater Cleveland

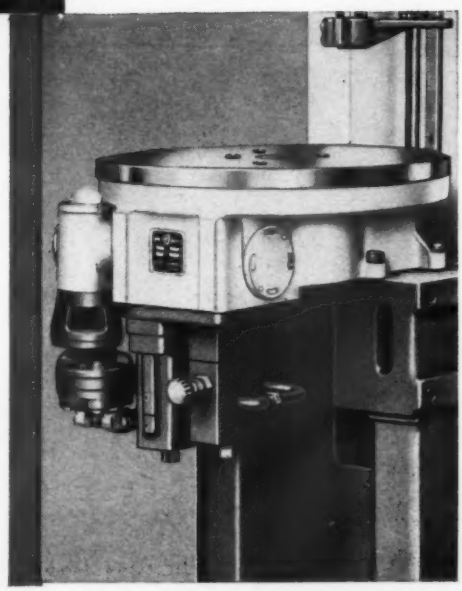
CIRCLE INFORM-A-GRAM KEY NO. 19

MEET THE NEWEST H-P-Ms . .

- 5, 10 and 15 Ton Models
- Completely JIC — All Models
- 2 Manual — 2 Automatic Systems
- All Controls Completely Interchangeable
- Small, Fast, Compact— Ideal For Automation
- Heavy Rugged Frames— Minimum Deflection
- Long Stroke — Plenty of Daylight
- Positive Ram Guides
- Complete Line Of Standard Accessories

THE FINEST INDEX TABLE-PRESS COMBINATION ON THE MARKET

The rugged H-P-M Index Table is designed specifically for use with the C-Frame hydraulic press. High speed and high load capacity effect a definite cost saving in the operator's time—no slowing the operation to suit the press. Indexing rate is fully adjustable and either clockwise or counter-clockwise rotation is available. Anti-friction bearings are used throughout—no bushing wear or tool misalignment can occur. The indexing mechanism is completely interlocked with the press ram action so that only one phase of operation can occur at any one time. The large 16" diameter work circle provides ample tool room as well as operator room. Ejector mechanisms or other auxiliary tools can be mounted directly to the housing. The hollow dial spindle permits the installation of air, water, gas, or electric lines through the housing to above the dial. Dial and spindle are sealed from the indexing mechanism so that liquids may be flooded over dial without damage to the indexing drive. Feature for feature—compare this H-P-M Index Table with any other on the market—it's the best!



. the new Versatile H-P-M C PRESS!

CHOICE OF OPERATING CONTROLS

Manual Valve

This is the basic type hydraulic control valve. It is a spool-type 4-way valve designed specifically for press use. Mounted directly on the cylinder, it can be actuated by either dual levers, single lever, foot pedal or electrical control.

Manual -Servo Valve

This servo valve is a 4-way, spool type valve with an integral feed-back mechanism to effect servo operation and a differential circuit which equalizes ram closing and return speeds. Can be actuated by either single lever or foot pedal.

Automatic Valve

This compound valve is an automatic auto-cycling valve for use with manual controls, incorporating pressure reversal, stroke length reversal and inching control. Various manual or electrical controls are available for use with this valve.

Automatic Valve with Index Table

This valve is similar to the AM valve, above, with the added feature of provision for driving and interlocking the index table. Various manual or electrical controls are available for use with this valve.

The outstanding features of these new H-P-M C-Presses provide them with versatility not found in ordinary hydraulic presses. They are designed as basic automation units. Properly tooled, they may be used for special purpose, high speed applications—or, using interchangeable tools, they may be readily converted to general purpose jobs.

Over 80 years of specialized experience and engineering in the field of hydraulics have gone into their manufacture. Simplification of control, operation and maintenance has been the determining factor in their design. Precision and quality are inherent in their workmanship.

An H-P-M engineer's experience in the application of hydraulics can be of real help to you in the selection of the proper C-Press for your particular application. He is as near as your telephone. Call him today.

HPM

HYDRAULIC PRESS MFG. COMPANY

A DIVISION OF KOEHRING COMPANY
MOUNT GILEAD, OHIO, U. S. A.

I'm interested—please send complete catalog information on the new H-P-M C-Press Line. My primary interest is in—

☐ Manual Presses ☐ Automatic Presses ☐ Automatic Index Table Presses ☐ Tonnage ☐ Have salesman call as soon as possible.

Name ..... Title .....

Company .....

Address .....

City ..... Zone ..... State .....

H830

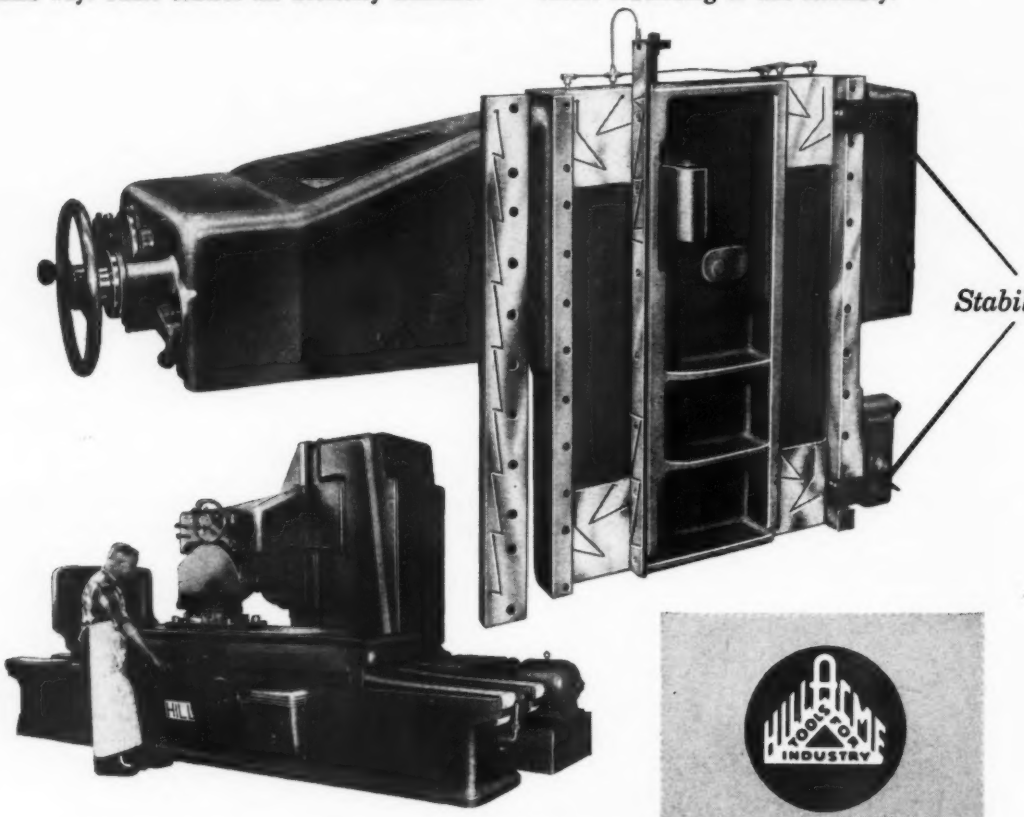
CIRCLE INFORM-A-GRAM KEY NO. 21

ONE REASON FOR THE PERMANENT ACCURACY

of HILL Surface Grinders

We believe that PERMANENT ACCURACY is basically a matter of engineering design. One of the reasons for the extreme precision of HILL Hydraulic Surface Grinders is the unique method of keeping the Horizontal Spindle saddle in perfect alignment.

The Horizontal Spindle saddle, on which the spindle motor and wheel head are mounted, is a heavily ribbed alloy casting which is normalized before finish machining. Note the stabilizers at the top and bottom of the right hand way. These control the necessary clearance for oil film between the saddle and the column. These stabilizers are spring loaded, cam follower type bearings and keep the saddle in perfect alignment at all times, supplementing the taper gib that is shown projecting above the saddle. Note also that the center portion of the saddle ways and the center section of the adjustable tapered gib are undercut to insure perfect contact with the column ways indefinitely. This is an exclusive HILL feature that eliminates the necessity of future rebuilding of this assembly.



THE HILL ACME COMPANY

1207 W. 65th STREET
CLEVELAND 2, OHIO

HILL Horizontal Surface Grinders are built in table lengths of 72" to 240" and in table widths of 24", 30" and 36". Also built in vertical spindle design. Detailed description in Bulletin HV 58.

CIRCLE INFORM-A-GRAM KEY NO. 22

Your tooling resin formulator can help you

In an ever-widening range of production applications, tools and dies made with Epon resin-based formulations are giving outstanding service . . . and providing considerable savings compared to the cost of conventional tooling.

If you are concerned about the high cost of conventional tooling—your tooling resin formulator will show you how to get the most out of durable, impact-resistant Epon resin tools. His skill and knowledge, combined with Shell Chemical's years of experience and research, can mean more profitable production for *you*.

High-temperature tooling. Both metal and plastic forming tools, capable of operating at temperatures between 400°F. and 500°F., can be made with Epon 1310.

Long-lasting metal forming tools. Test results show that a casting of an Epon resin formulation mounted in a crank press and subjected to repeated blows had no permanent deformation after 28,000 cycles.

Excellent tolerances. Little machining and handwork are required to finish Epon resin tools, because the material can be fabricated to very close tolerances.

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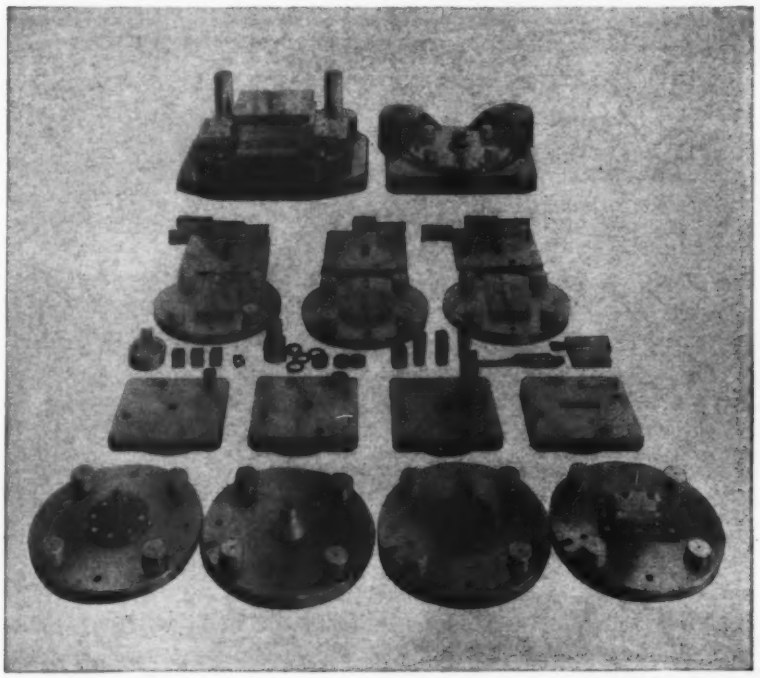

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VULCAN tools

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Talk of the Month

ADVANCES IN APPLYING ABRASIVE BELT GRINDERS

by John A. Simmons
Product Manager
ENGELBERG, INC.
Syracuse, N. Y.

THE GROWTH OF ABRASIVE BELT GRINDERS — both in terms of new machines and new applications — has been nothing less than phenomenal during recent years. From the following few brief examples of new applications and machines, the importance and potential of this relatively new machining method is evident:

One such example involves something with which we are all familiar, the tab and margin racks on typewriters. This year a single abrasive belt grinder was developed to perform six different grinding and finishing operations on these racks. It consists of four grinding heads mounted in vertical and horizontal sequence, followed by two wire brush heads. Parts are through-fed at rates of from 5 to 30 sfpm; an air-operated stacking device provides completely automatic unloading. This machine is credited with an annual saving of 8000 man-hours.

Centerless abrasive belt grinding has also become multiple-headed. In one recent installation, alloy steel socket wrenches are sized and finished on a three-head model. In a single pass with stock removal of 0.004", the socket wrenches are sized at a rate of 1000 to 1200/hr.

Multiple Head Conveyor Types

An important step in furthering the role of belt grinders has been the

Adapted from Mr. Simmons' talk at Westinghouse Electric Corp.'s 22nd Annual Machine Tool Electrification Forum.

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The operators and plant management of a leading manufacturer of earthmoving equipment highly endorse the simplified controls of the Bullard Cut Master V.T.L., Model 75.

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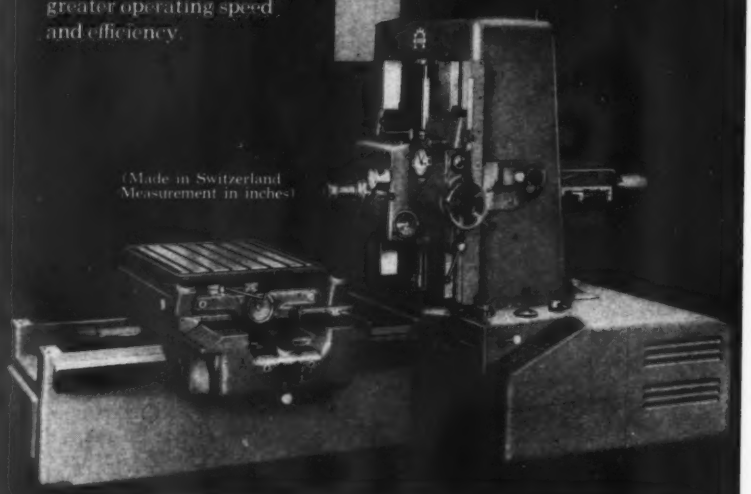

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recent development of a multiple-head conveyor-type series. By carrying parts under a series of grinding heads, one machine permits as many as six or more operations in a single pass. Using a sequence of abrasive belts having progressively finer grits, an unmachined part can be ground to a fine microinch finish in one continuous operation. Or, in operations requiring exceptionally heavy stock removal, identical belts can be used to increase production rates.

In contrast to the reciprocating feed of various alternative machining methods, conveyor-belt through-feed permits continuous straight-line production, with no dead time for loading and unloading. One four-head model removes 0.005" stock from tool steel chainsaw bars, and holds a tolerance of 0.001" at a production rate of 10 sfpm. Another six-head machine sizes and finishes pliers at a six-in-one production rate of 3000 sides/hr.

In the electronic field, abrasive belt grinders are widely used, particularly for surfacing printed circuits and other phenolic laminates. By the use of a two-head model with two conveyor belts and a gravity turnover device, both sides of printed circuits can be finished in one continuous pass.

Atomic Applications of Abrasives

One of the most interesting challenges faced and met by abrasive belt machining is the sizing of atomic fuel elements. Because of their extreme brittleness and fragility these solid fuels are exceptionally difficult to machine. In centered cylindrical form, these ceramic fuels — uranium, uranium dioxide, and plutonium — normally are bowed and out-of-round. They must be accurately sized to insure proper air-gap clearance as they move through the feeding tubes of atomic reactors and rocket engines. As opposed to other machining methods abrasive belt centerless grinding has proven the best and perhaps the only solution for this operation. A combination of a resilient abrasive belt and a rubber back-up wheel provides a shock-absorbing quality necessary to eliminate breakage. Less pressure is generated against the workpiece because of the free-cutting action of the abrasive belt.

An abrasive belt centerless grinder is today part of the first fully automated production line for atomic fuels. The line was designed to produce lower enrichment, powdered metal ceramic fuel of a size measuring ½" dia and ½" long. These uranium dioxide slugs, following the

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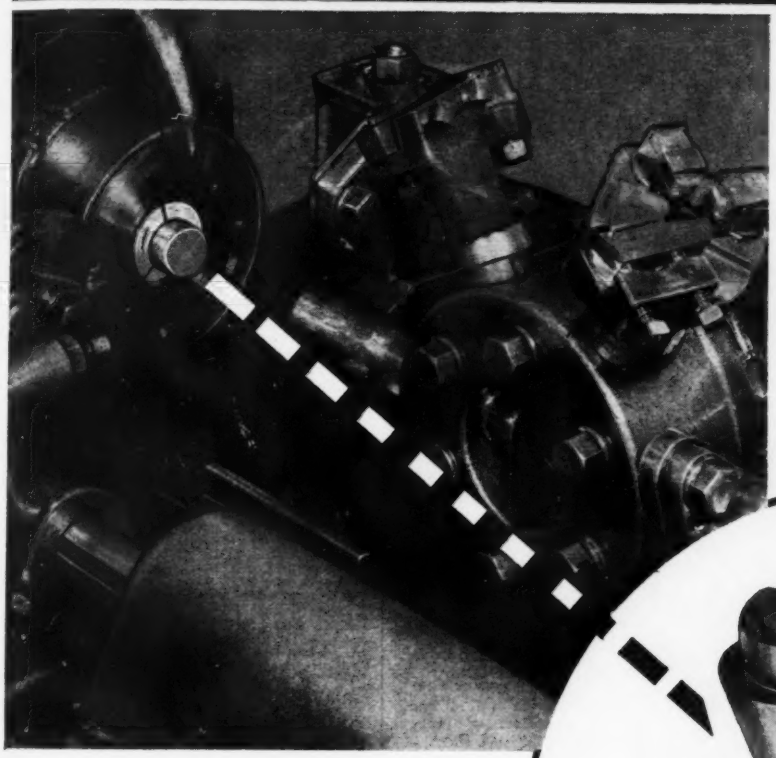

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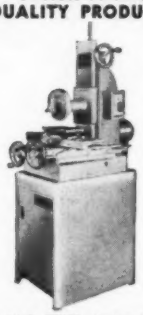

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molding and sintering operations, are sized by removing 0.003" of material at a feed rate of 5 sfpm. Slugs are held to a tolerance of ±0.0005" TIR.

An air-electric gage measures the belt-ground OD of the fuel slugs as they move along the machine's work-rest blades. The size trend is indicated by colored tolerance lights on top of the control console, which can be adjacent to or remote from the machine. The size trend from the air gage is interpreted at the control panel which generates an impulse to activate the feed mechanism and automatically makes the necessary compensating adjustments.

Bigger Atomic Energy Uses

Another centerless belt grinder has been developed that will accommodate atomic fuels from ½" to 6" dia. One of these large diameter belt grinders, installed on a pilot test basis, is used to size high enrichment uranium or plutonium fuel slugs and their aluminum casings. The solid fuels range in diameter from 0.5" to 4.5" and in length from 0.5" to 8.8". Located in a stainless steel, lead, and glass-protected room, the hooded belt grinder removes from 0.005" to 0.010" stock from the diameter to tolerances of 0.0005" TIR. The belt-ground fuel slugs are then inserted in the casing of 2S aluminum, a chemically pure, dead soft aluminum. These casings, in turn, are belt-ground, with stock removal up to ⅛".

Sizing these atomic fuels is only one of many applications to which this machine lends itself. In the automotive field, when fitted with automatic infeed controls, this same machine has been assigned the job of rough-grinding and finish-sizing steel countershafts. The rough-grinding operation removes 0.012" material at a feed rate of 4 sfpm; the finish-grind removes an additional 0.002" of material at a feed rate of 7 sfpm, with tolerances of 0.0005" TIR. This machine utilizes an 8" x 132" abrasive belt and a 25-hp motor and permits feed rates of from 4 ipm to 40 sfpm.

For long bar and tube stock up to 7" dia and 25' in length the machine is equipped with long-bar outboard supports and a 50-hp motor. The outboard supports may or may not be powered, depending upon the weight of the material being processed. An added feature is a reverse-feed mechanism which permits progressive through-feed passes in either direction with no intermediate material handling.

. . . *Continued on page 30*

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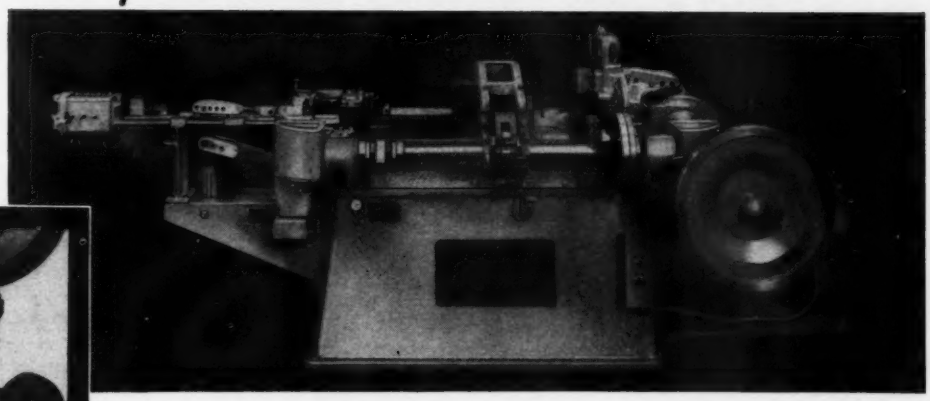

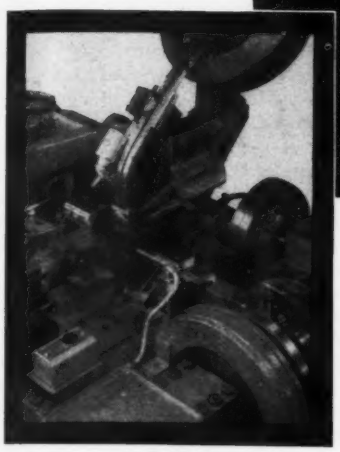

FIGURE 1A

Model #35 U. S. Multi-Slide Machine in which 4 die heads (rams) can be used simultaneously.

The versatility of the U. S. Multi-Slide for the production of stampings, or assemblies which include stampings, enables you to reduce piece part costs by eliminating expensive secondary operations.

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Ask for a copy of Bulletin #15 (P) or, to compare manufacturing costs send in samples or drawings of the part you want to produce.

FIGURE 1

FIGURE 1. Sequence followed in producing cage and nut assembly on #33 U. S. Multi-Slide. Cage made in machine from flat stock which comes in coils. Prefabricated nut hopper fed—(Figure 1A) into position and clinched to complete the assembly.

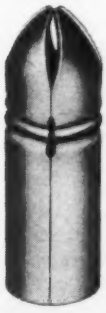

FIGURE 2

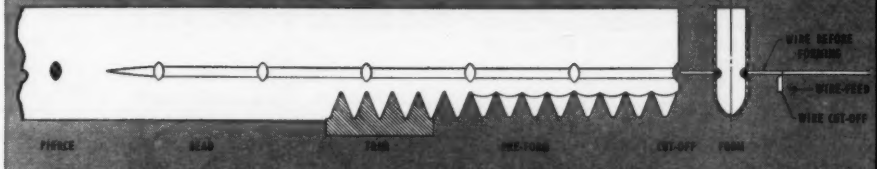

FIGURE 2. Tube reinforcement consists of a flat stock stamping and a wire part—both produced and assembled in a #35 U. S. Multi-Slide. Flat stock progressed from left to right and wire from right to left as indicated. Assembly completed in final forming position.

PRODUCTS

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. . . Month's Talk from page 28

More Down-to-Earth Uses

Another example of new abrasive belt units is a multiple-head machine for grinding and finishing screwdriver blades. Although it is for a very specific application, it will emphasize the wide range of application and design of abrasive belt grinders.

The central design feature of this special machine is its merry-go-round fixture mechanism, a feature which in principle lends itself to a variety of other grinding and finishing requirements. The machine consists of seven individual grinding heads and a rotary chain-drive fixture on which 20 chucks are mounted.

The operating sequence is as follows: The operator inserts blades in the moving chucks; the blade is automatically positioned and locked; the first head, which is vertical, grinds the blade tip; the second head rough-grinds the blade "hip"; the chuck turns 180°, and the opposite hip is rough-ground; the chuck turns 90°, and the shank is rough-ground; the chuck turns 180°, and the opposite shank is rough-ground on the fifth head, finish-ground on the sixth; the chuck again turns 180°, and the opposite shank is finish-ground. The blade is then automatically ejected.

One complete cycle — 20 blades, 7 operations — takes only 90 sec. Each of the seven heads is individually adjustable to accommodate different size blades, and additional sets of chucks can be used to increase the size range. This machine is reported to have upped production by 800% and to have eliminated four separate machining operations.

Fixturing Very Important

Fixturing is an essential element in realizing the production and application potential of abrasive belt grinders. The fixture may be a simple magnet plate used to secure parts as they are ground against a platen-backed belt or it may be an integral part of the machine, as in the case of the screw-driver model.

Where parts are carried under a series of grinding heads by a conveyor belt, the conveyor belt itself can be used as the fixture. A hardware manufacturer cemented neoprene fixture blocks to the conveyor belt of a two-head belt grinder used to surface the face of brass escutcheon plates. Each of the molded fixture blocks has four recesses which conform to the undershape of the parts, and presents them face up as they move under the grinding heads. A similar model is used to remove excess flash following a phenolic molding operation on beryllium-copper stator components for electrical accounting machines. In this application, the parts are stacked in a gravity-feed rack and an oscillating feed bar pushes them one at a time onto the belt grinder's conveyor belt.

Jets Take Abrasive Belts, Too

The complex grinding and finishing requirements of jet engine components has presented an exceptional fixturing challenge to manufacturers of abrasive belt machines. To illustrate, the blades on compressor and turbine rotors for jet engines eventually become bent, burned, scored, and so forth, and must be replaced in the rotor. The roots of these blades, either pure titanium or stainless steel fortified with titanium, form a loose fit in the compressor and turbine rotors. The reason for this is to allow for subsequent expansion of the metal, caused by high temperatures generated when the engine is in actual operation. The problem is to hold the blades rigid in the wheel as the tips are belt-ground.

. . . Continued on page 32

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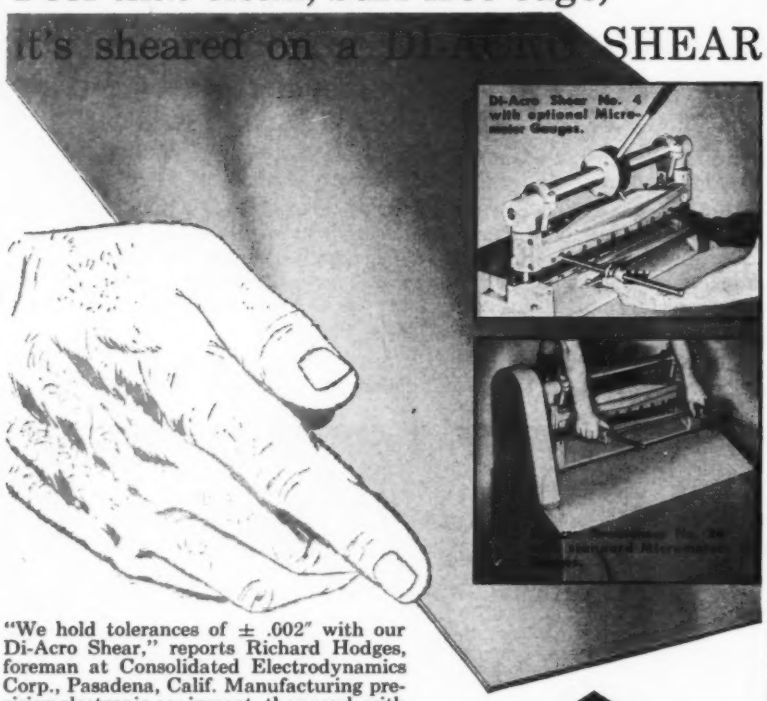
it's sheared on a DI-ACRO SHEAR



"We hold tolerances of ± .002" with our Di-Acro Shear," reports Richard Hodges, foreman at Consolidated Electrodynamics Corp., Pasadena, Calif. Manufacturing precision electronic equipment, they work with a variety of sheet materials—fish paper, beryllium copper, phosphorous bronze, hot and cold rolled steel, aluminum, etc. "Parts must be burr-free—require no milling to assure a 'light-tight' fit."

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Available in two power models in 12" and 24" widths and four hand operated models 6" to 24" wide. "Quick-Set" Micrometer gauges are standard on power models, accessories on hand operated shears.

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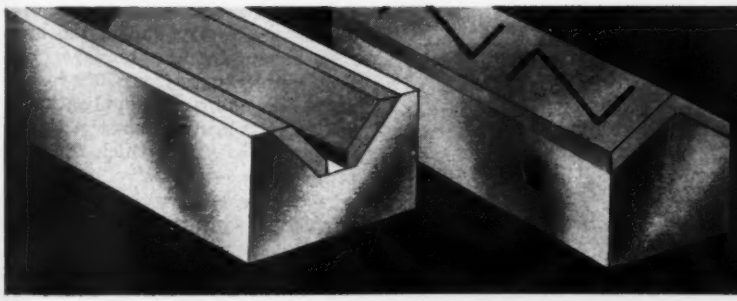

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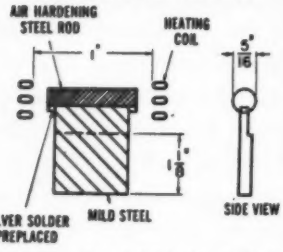
TYPICAL INDUCTION HEATING APPLICATIONS

SIMULTANEOUS HARDENING and BRAZING



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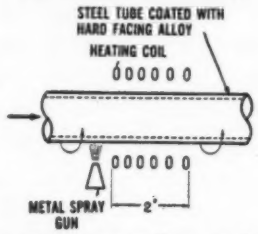
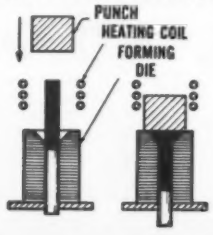


Corrosion or wear resistant metal coatings sprayed on metal surfaces can be improved by heating to achieve alloying by diffusion. The drawing shows a typical arrangement for processing steel tube sprayed with hard facing alloy. Long tubes may be progressively sprayed and heated.



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. . . Month's Talk from page 30

The solution was a special grinder equipped with a high-speed rotary table. The compressor and turbine rotors are revolved at rates of from 350 to 700 rpm, with the work table powered by a 3-hp d-c motor. As a result, sufficient centrifugal force is generated to hold the blades rigid as they pass across the face of the abrasive belt. Depending on the OD of the wheel, the tip speed may be as high as 9400 rpm. The rotary table accommodates workpieces from 28" to 38" dia. To use the full width of the abrasive belt, the table is pneumatically oscillated. Oscillation range is 0 to 7", from frequencies of 0 to 30 cpm.

The infeed rotary table of the machine moves toward the table at a minimum infeed rate of 0.002 ipm with a total travel of 5". The head is designed so that a trunnion permits an angular adjustment up to 15° from the table. The compressor blades are ground to a tip-to-tip OD tolerance of ±0.00125", with approximately 0.008" stock removal.

In a similar application involving new fixed-blade compressor stators for jet aircraft engines, another machine belt-grinds the outside diameter with stock removal as high as ½". The self-contained motor-driven work table rotates at standard speeds of either ¾ or 3 rpm with optional change gears for other speeds. An air-controlled infeed mechanism carries the rotating parts in against the belt. Infeed travel is adjustable with a minimum of 0.0016 ipr. It is designed to handle stators from 26 to 40" dia.

As the revolving table moves the workpiece in against the abrasive belt, the parts at the same time are moved back and forth across the belt face by an air-hydraulic oscillating device. The rotary work table is adjustable from 0 to 45° for angular grinding. This machine will handle any circular parts within this size range, and can be modified to meet other diameter ranges. A Tampeco brush was incorporated into the machine design for applications requiring deburring. In this particular stator application, however, it proved to be unnecessary due to the burr-free cutting of the abrasive belt. Belt speed ranges from 2000 to 5000 sfpm, depending upon application.

These applications suggest the innumerable ways in which the basic components — abrasive belt, drive wheel, and idler wheel — can be adapted to meet the varied grinding and finishing demands of present-day industry. end

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These improved blades are available in MO-MAX or MO-MAX COBALT High Speed Steels, heat treated to produce *more cuts per grind*. Head and body are ground to close tolerances, resulting in accurate uniformity and reduced set-up time.

Split Sleeves for Straight Shank Drills

The hole in these high quality sleeves is concentric with the body, assuring less run-out at the drill point, longer tool life and better holes. Used with tanged straight shank drills, you get *more flute length at lower cost.*

MO-MAX Hardened and Ground Drill Blanks

New Drill Blanks—hardened all over, and ground without back taper. Wire gauge, letter and fraction sizes, No. 80 to ½ inch, singly or in sets. Useful for making punches, tool bits, countersinks, boring tools, burring tools, etc.

Carbide Die Drills for Hard Steel

For drilling hardened steel in the range of 48 to 65 Rockwell C. Holes may be drilled without annealing or appreciably changing the structure of the material. Can be used with or without coolant.

END MILLS

Two Flute Extra Long Ball-nose

They have the extra length for milling fillets and pockets which cannot ordinarily be reached by the conventional length end mills. With these center cutting end mills, the initial hole may be "drilled".

Hy-Spiral Two Flute Double-end

Proper rake angles and cutting edge relief assure efficient milling in non-ferrous materials and in the harder alloys. Positive chip ejection . . . no build-up on the cutting face. Especially economical on long runs.

Two Flute Double-end Ball-nose

Machine-ground notch and ball end assure the easy removal of chips in deep slotting and pocketing operations, with the resultant savings realized in more material milled per grind. Economical on production runs.

Heavy Duty with Duo-Drive Shanks

The 2 inch DUO-DRIVE shank fits the conventional two-set-screw-drive holder as well as the bayonet-lock type of holder. Heavy web construction, accurate machine-ground end-tooth notching and special surface treatment.

500 SERIES Four Flute Center-cutting

Now you can get the plunge cutting ability of a two or three flute end mill with the finer finishes and better size control that are possible with a four flute end mill. Made with square nose or ball nose.

THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

for increased production . . .
minimum down-time . . .
lower costs . . . specify

SP

AIR and HYDRAULIC CYLINDERS

SERIES A

Rated 200 psi air and up to 500 psi oil or water, 23 mounting types. Corrosion-resistant, precision-honed, hi-tensile brass tube.

SERIES H

Rated 2,000 psi hydraulic. Complete range of mounting types. Precision-honed seamless steel tube.

- floating cushions—uniform cushioning—long life—fully adjustable
- easily removed cartridge-type rod seals with integral rod wiper
- choice of rod sizes for all applications—rods heat-treated and hard chrome plated for resistance to nicking and scoring
- steel heads and end plates for strength and positive alignment
- all ferrous parts rust-proofed

Before you buy any cylinder, consider the quality design and construction features of S-P air and hydraulic cylinders—features that will assure dependable performance . . . long service life . . . minimum down-time . . . lowest end cost.

What's your cylinder problem? We'd like to help you solve it—a phone call will bring our representative on the double. Prompt deliveries, too. The S-P Manufacturing Corporation, 30201 Aurora Road, Solon, Ohio.

SP for speed and performance

Representatives in principal cities. Phone or write for Catalogs No. 1108 (Series A) and No. 104A (Series H).

Find us fast in the "Yellow Pages"

NON-ROTATING AIR AND HYDRAULIC CYLINDERS • ROTATING AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • COLLET AND DRILL PRESS CHUCKS • VALVES, ACCESSORIES

A BASSETT COMPANY • IN GREATER CLEVELAND • ESTABLISHED 1916

AA-7407

CIRCLE INFORM-A-GRAM KEY NO. 34

New southern district sales manager for the Steelweld line of The Cleveland Crane & Engineering Co. is **Eugene G. Bates. David B. Sayle** is the new northern Ohio sales representative, with his office in Cleveland.

Regional sales manager for the midwestern and southwestern states for Devcon Corp. is **Donald W. Smith.**

Edward W. Schnabel has been named manager, Tool and Die Materials, at the St. Louis district sales office for Allegheny Ludlum Steel Corp.

Taking over as sales manager for the Electropoint Division of Electrosystems, Inc., a subsidiary of Royal Industries, Inc., is **Josh Gershuny.**

Appointment of **E. G. Bowerman, Jr.** as sales manager of Bearings, Inc., has been announced by the company.

Frederick E. Allison, Jr. heads the new St. Louis branch office to serve Latrobe Steel Company customers in Missouri, Kansas, southern Illinois, northern Arkansas, and Oklahoma.

Fred C. Stockinger is being promoted from West Coast district manager for the Bay State Abrasive Products Co. to assistant sales manager at the home office.

Ace Drill Bushing Co., Inc. announces that **James Giles** will handle distributor accounts from Los Angeles to El Paso, Texas, and **Bob Oster** will cover the Los Angeles to San Francisco territory.

Now serving as eastern regional sales manager for the Tool and Wheel Division of American Coldset Corp. is **C. E. Post.**

The following appointments have been made at Minneapolis-Honeywell's Boston Division: **C. B. Harrison** begins as the new marketing manager and will also direct sales; **J. A. Vitka** is contract administration manager; and **W. A. Rote** is director of engineering, heading research and development, pre-production, products, and special engineering activities.

Taking over as general sales manager for the Tubular Products Division of The Babcock & Wilcox Co. is **Leon B. Wohlgemuth.** He was formerly sales manager of the middle states district sales offices.

now, pre-set tools to accurate part dimensions outside the machine with this new Microbore® System

SIMPLE 4-STEP PROCEDURE

1. To set up pilot tool, insert Microbore "Pre-Set" unit in boring bar. Adjust to part dimension by trial cut and final setting using Micrometer Vernier adjustment.

2. Remove adjusted pilot tool from the boring bar and install in the standard Microbore setting block.

3. Position indicator stylus on high point of pilot tool in setting block and adjust indicator to zero.

4. Adjust gage pin to same zero setting. Any number of additional tools may now be pre-set and interchanged with pilot for precision boring the same diameter.

If necessary to pre-set for depth of bore, tumble block to adjacent side and repeat procedure.

Eliminate trial cuts... change tools in seconds... simplify tool maintenance

Using a standard setting block and indicator, Microbore tools can now be pre-set to accurate part dimensions outside the machine and quickly locked in the boring bar or tool holder without further adjustment.

"Pre-Set" eliminates scrap parts due to trial and error set-up and greatly reduces down time for worn tool point adjustment. "Pre-Set" encourages the operator to keep sharp tools in the machine assuring greater accuracies and produces the maximum number of pieces per tool grind by minimizing breakage due to dull tools.

"Pre-Set" also makes it possible to replace worn tools without changing the entire boring bar or tool holder—eliminates the need for stand-by bars —simplifies tool grinding and maintenance.

Microbore System of "Pre-Set" tooling may be applied to boring, turning, facing and chamfering operations and is especially suited to production and automated operations where machines must maintain peak production on long runs. Write for complete information.

The DeVlieg Microbore System of Adjustable Precision Tooling includes Standard Microbore Boring Bars and Boring Bar Sets, Special Cluster Tooling, Flash-Change Tooling and Tool Holders, Flash-Change Replacement Bridgeport Spindles, Turret Lathe Turning Heads and Adjustable Boring Heads.

DeVlieg Microbore® System

DE VLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY

Fair Street, Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 35

to serve your filtration needs better....

COMMERCIAL FILTERS CORPORATION ACQUIRES

Delpark

Now, from one source, you can meet your complete needs for fine filtration through three broad lines — Delpark Filters, Fulflo Filters, and CFC Filters which include Honan-Crane and Michiana models.

To provide more comprehensive service, Commercial Filters Corporation has acquired the Industrial Filtration Company, manufacturers of Delpark Filters. The company will operate as the Delpark Division of Indiana Commercial Filters Corporation, Lebanon, Indiana.

Delpark FILTERS Delpark offers a large selection of filters for coolants, cutting oils, quenching oils, rolling oils, and lubricants — for both heavy and light dirt loads. Products also include a filter for paint spray booth water. Filter media consist of natural or synthetic fibres and metal screens in tubular or leaf form.

Fulflo FILTERS Fulflo Filters, with genuine Honeycomb Filter Tubes in a variety of natural and synthetic fibres, offer true depth filtration to any degree of continuous micro-clarity. Applications include all kinds of oils, fuel, water, chemical solutions, compressed air, CO_2 and other gases. For high or low flow rate, pressure, viscosity.

CFC FILTERS CFC Filters, including Honan-Crane and Michiana models, provide selective filtration of all types of oils — lubricating, coolants, quenching, hydraulic, diesel, etc. Bulk and cartridge type elements. Products also include impregnating oil dehydration units, magnetic separators, automatic tubular conveyors, coolant clarifiers, and settling tanks

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

MICRO-CLARITY AT MINIMUM COST

Fulflo FILTERS — *with genuine Honeycomb Filter Tubes for controlled micro-clarity of industrial fluids.*

CFC FILTERS — *Selective filtration of oils • water-oil separators • magnetic separators • pre-coat filters • coolant clarifiers • automatic tubular conveyors.*

CIRCLE INFORM-A-GRAM KEY NO. 36

THROW-AWAY INSERTS INCREASE PRODUCTION, DECREASE COSTS

Thirteen steel guide bushings can now be threaded for the former tool cost of threading one bushing, and threading speed is 37% faster, a manufacturer of rock drills and mining machinery reports, after changing from brazed carbide tools to "throw-away" insert tools. The bushings are used for piston feed guides. They are made of SAE 8720 steel and have 2.122-16NS threads machined on them in the Denver plant of Gardner-Denver Company.

Cutting speed was increased from 290 to 442 sfpm which reduced threading cycle time from 0.646 min to 0.404 min. On a test run the speed was increased to 800 sfpm, thereby reducing the cycle time to 0.227 min/pc. However, 442 sfpm allowed the operator more time to move pieces to and from his machine and gave better insert life. The feed is automatic — 14 passes with an equal amount of in-feed per pass.

The savings in tool costs and time were made with Kendex tools, made by Kennametal Inc., Grade K7H triangular inserts with 0.005" nose radii are used in a Kendex Style KTDR-12 negative rake holder. These tools replaced Kennametal Style E-10 brazed type, positive rake, Grade K4H tools.

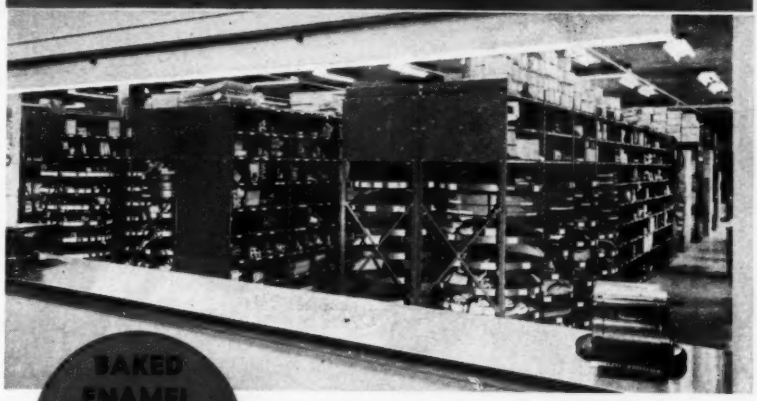
The number of pieces threaded per indexable cutting edge is 175, and the total for six cutting edges is 1050 pcs. In a test operation at 800 sfpm, tool life was 101 pcs per cutting edge or 606 per insert. Only 300 pcs could be threaded by the brazed tool, with five regrinds.

Brazed tool cost was $7.86 for 300 pcs, with brazed tool price of $2.86 and five regrinds at $5. Thus tool cost/100 pcs was $2.62. Kendex insert tooling costs $2.17 for 1050 pcs or $0.206/100 pcs. This figure is based on a K7H insert cost of $1.38 plus $0.79 (holder cost prorated over the life of 10 inserts). This shows a cost reduction of $2.414/100 pcs. Threading was done on a Sentinel Cri-Dan Model "B" machine.

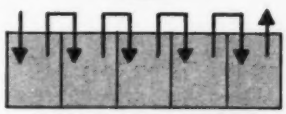
———— • ————

The Producto Machine Co. of Bridgeport, Conn., has put its Newton Highlands, Mass., assembly plant in operation. This facility will provide service on die sets, diemakers' accessories, and toolroom equipment to industrial plants in the greater Boston and eastern Massachusetts area.

F-G-M STORAGE EQUIPMENT
LASTS LONGER, LOOKS BETTER BECAUSE IT'S
BONDERIZED



BAKED ENAMEL
BONDERITE
METAL



FULL FIVE STAGE TREATMENT

Yes, Frick-Gallagher rotating bins, Steel Shelving, Racks and other types of storage equipment are Bonderite-treated to give you the finest, longest lasting and best looking finish you can find today.

In the new, ultra-modern F-G-M finishing plant, every piece is given the *full, five-stage Bonderite treatment* before the enamel finish is electrostatically applied and thoroughly baked. The result is a protective finish that will last through years of hard service, protect the metal from the effects of moisture and oxidizing agents, confine finish damage to the site of accidental scratches or dents . . . there's no peeling, no scaling.

If you need storage equipment, or assistance in planning a storage area, it will pay you well to discuss your requirements with an experienced Frick-Gallagher Storage Planning Engineer. Write for your free copy of Brochure 700-A on how to double your storage capacity.

The FRICK-GALLAGHER Mfg. Co.
106 S. MICHIGAN AVENUE
WELLSTON, OHIO

FGM

ROTABINS | STEEL SHELVING | WAREHOUSE RACKS | COUNTERS | SPECIALTIES

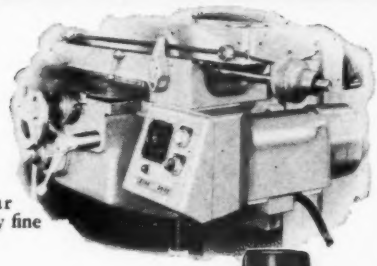
CIRCLE INFORM-A-GRAM KEY NO. 37

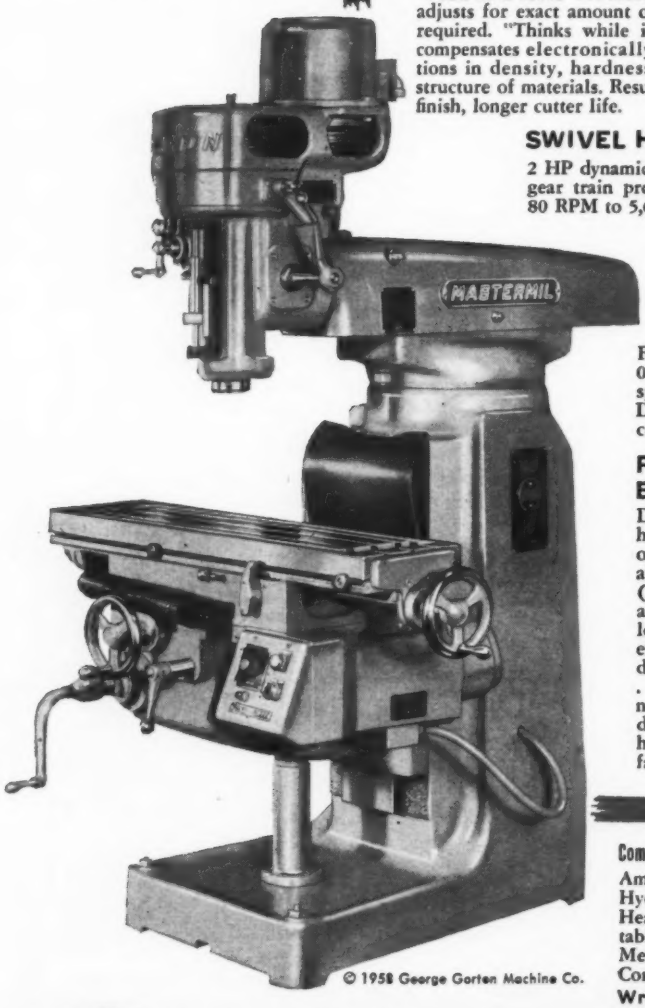
Eventually you'll buy a GORTON MASTERMIL

here's why

DYNA-DRIVE
"The Torque-Thinking" Table Feed

"Feels as it feeds"... automatically adjusts for exact amount of torque required. "Thinks while it works", compensates electronically for variations in density, hardness, molecular structure of materials. Result: Superbly fine finish, longer cutter life.



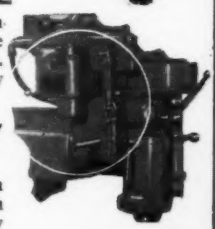


SWIVEL HEAD

2 HP dynamically balanced motor with belt and gear train provides wide range of speeds from 80 RPM to 5,600 RPM. Head swivels 90° left or right, head, ram and turret rotate 180°. Cross movement 14 inches. Push button starting.

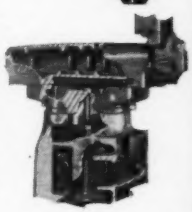
DOWN FEED INFINITELY VARIABLE

Feeds may be varied infinitely from 0" to 5" independent of spindle speeds. High efficiency belt drive. Direction and rate of feed separately controlled.



PERMANENT ACCURACY BUILT-IN

Distortion is prevented by extra heavy one-piece column cast with over-size ribbing . . . extra heavy alloy steel turret clamping bolt (1⅜" dia) with 3-point clamping action . . . heavy dovetail way full length of vertical column face . . . extra large table, knee and 24" saddle (2" longer than table travel) . . . square lock bearings with long, narrow guide between knee and saddle . . . positive locks . . . extra heavy feed screws . . . bearing surfaces hand-scraped.



© 1958 George Gorton Machine Co.

Complete Versatility Through Attachments Built-In or Field Installed.

Among such equipment is, Trace-Master Hydraulic Tracer Control, Duplicator Tracer Head and/or Table with base, saddle and table in one unit, 6" Raising Block, End Measuring Rods and Dial Indicators, Self-Contained Coolant System.

Write for Bulletin 2699 - 1209

GORTON SINCE 1893

GEORGE GORTON MACHINE CO.

1209 RACINE STREET • RACINE, WISCONSIN 56-1

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A8-1008

CIRCLE INFORM-A-GRAM KEY NO. 38

UNIVERSAL DRILL BUSHINGS

industry's standard of quality and service

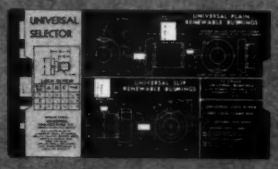
All standard sizes and lengths available for immediate delivery.

100% concentricity and hardness tests insure accuracy.

Knurled heads provide good grip.

Write for free catalog describing Standard Drill Bushings, Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, Kwik-Switch Tool Holders, Mikro-Lok Boring Bars, Index Plungers and other Universal Products.

Superfinishing of Universal Drill Bushings is an important factor in keeping tool and bushing wear to a minimum . . . especially in close tolerance work. Blended radius helps prevent tool hang-up.



The Universal Drill Bushing Slide Chart gives accurate engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size. Request your calculator—free—on your company letterhead.

208

UNIVERSAL ENGINEERING COMPANY | FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 39

New TUMBLE JIG

Available in 47 sizes

Patent Applied For

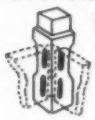
Offers Many Big Advantages

- ONE-HALF THE WEIGHT
- TRI-METAL CONSTRUCTION — Aluminum — Cast Iron — Steel
- 6-SIDE UTILITY — Can Use Head-Type Bushings, on Sides, Top, Bottom
- 5 HANDLE LOCATIONS — Handle can be attached to Any Side or Bottom
- ONE HAND OPERATION — Thumb screw releases Lid Instantly
- LEAF "POP-UP" — Automatic Action Spring Plunger Snaps Lid Open
- STABLE — Rugged Construction

Standard Parts is First with Exclusive New "TUMBLE" Box Jig

New design features, new engineering concepts, new construction techniques . . . are incorporated in this outstanding line of "Tumble Box Jigs. By combining 3 metals — aluminum, cast iron, steel — half the weight has been eliminated. This increases efficiency and production. The sturdy handle (can be located on any side) makes tumbling fast, easy and safe.

Bushings can be used on all 6 sides. A unique interlocking feature is the aluminum through the cast iron legs, which assures strength and stability. Walls can easily be machined without distorting the Jig. 47 Sizes available 1" x 1" x 1" to 4" x 8" x 4". *Full size Tracing Templates are available for all 47 sizes.*



Interlocking Leg Joint

Aluminum goes all the way through the cored slots in the cast iron legs — forms a unified, interlocking joint — assuring light weight, but rugged strength.

HANDLE may easily be attached on any side or bottom of the jig as needed.

TUMBLE — Universal tumble direction is advantage of this light-weight jig — where handle can be located where desired.

Ask for TUMBLE JIG BULLETIN

STANDARD PARTS CO.

1002 BROADWAY • BEDFORD, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 40

MANUFACTURING MEMOS

Make Mine Form Relief

That's what Royal Oak Tool & Machine Co. is getting grinder users to say with its series of two-day form relief grinding seminars. They supply the know-how; you send the students. There is a slight fee for the course.

Another good idea from Royal Oak is their use-it-yourself tool kit, which they're sending to people interested in their drilling tools. They answer inquiries from prospects with a box of sample tools, ground with axial and radial relief and a combination of the two. The inquirer tries them out and when he's finished testing them, puts the kit in the returnable box, licks the stamps provided, and sends them back.

Drilling Little Holes

The Sheffield Corp.'s willing and able to take small deep hole drilling headaches. They'll drill as deep as 44" and from ⅛" to ½" dia, with hole straightness to within 0.001" per foot through 44", and diameter tolerance of 0.0003" in materials of consistent structure. Thus, you have your holes sans headache.

Fast Return

Take a look at Standard Pressed Steel Co.'s figures: They say completely adjustable shelving returns savings over its life-time 15 to 20 times the purchase cost. This shelving also saves 30% shelf and floor space, and shelves can be changed in minutes. Good investment!

Quick as a Wink

Newest addition to the Motch & Merryweather Co. family is the Wink Cutter Division. It produces a very high speed precision machine for slicing rubber, plastic, and textile fiber tubing and rods "quick as a wink."

Hate Coffee?

That's not quite what Engelberg Huller Co. Inc. says. 'Way back at their beginning in 1888, the "Huller" part of the name referred to the rice and coffee hulling machinery they specialized in. Times have changed and abrasive belt machines, not rice and coffee hullers, are the star attractions now, so the company has changed its name to Engelberg, Inc.

Tool Film Library

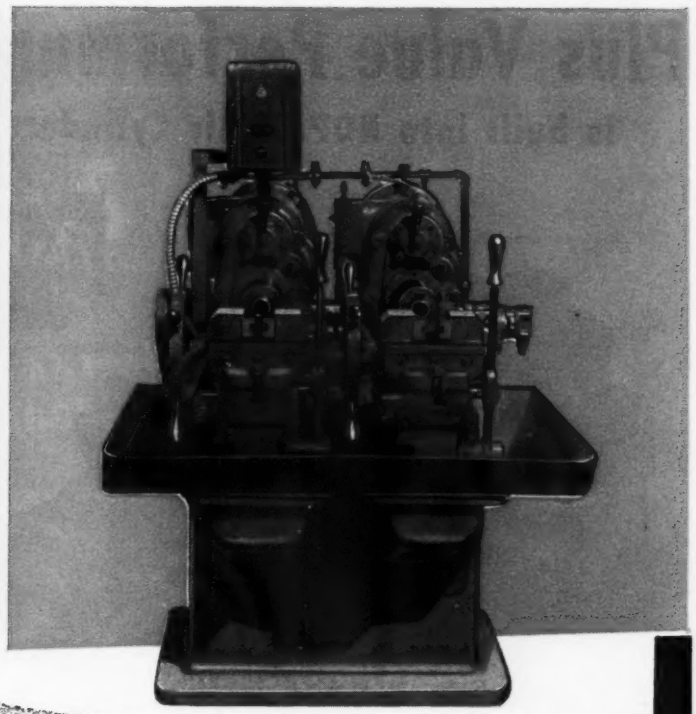
X-rays are used by Abrasive Dressing Tool Co. to position diamonds most precisely in dressing tools. They've also begun a film library to keep track of each Di-X, X-rayed tool and its specific use.

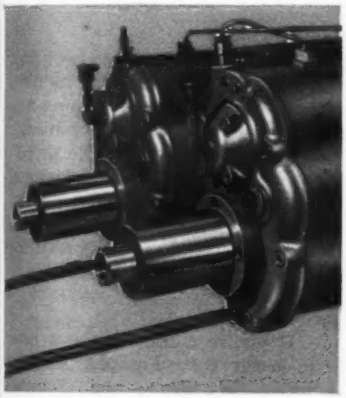
Two In One

The American Gear Manufacturers Assoc. has revamped its organization creating a Gear Products Division to handle marketing, statistical, and other management problems; and a Technical Division to deal with standardization matters. New AGMA officers are E. F. Borisch, president; J. L. Buehler, vice president, Gear Products Division; F. Richardz, vice president, Technical Division; and J. F. Murray, treasurer.

. . . Continued on page 42

DOES YOUR PRODUCTION REQUIRE HORIZONTAL TAPPING?





...then you need Cost-Cutting

Custom-Designed CAPCO 2-SPINDLE HORIZONTAL TAPPER

Now available at a standard machine-tool delivery time and price!

The only machine of its type now available for tapping pipe or tubular ferrous and non-ferrous metals too long to handle vertically, this "CAPCO" 2-Spindle Horizontal Tapper is designed and built for years of rugged service. *High production* is one of the outstanding features of the machine, operating at tapping speeds from 60 to 240 r.p.m., and to a maximum depth of 4". Ample power for toughest jobs is provided by the 5 h.p. motor. Mechanically operated jaw clutches assure performance to spare for driving all taps, right or left hand threads, up to and including 1⅞". Tough, hardened steel two-jaw vises accommodate work up to 2⅛" in diameter, holding without distortion.

Designed in a production plant for production operations, the new "CAPCO" 2-Spindle Horizontal Tapper is available at a price no higher than for equipment ordinarily sold on a standard machine time delivery basis.

This machine is available on an open territory basis. Dealer inquiries invited WIRE — PHONE — WRITE — *today for complete details and specifications.*

HIGH PRODUCTION AND FLEXIBILITY FOR LOW-COST OPERATION

Flexible operation assured throughout range of tap sizes by ease of speed changes.

Speedier production — resulting from reversing speed of 150% of tapping speed for all ranges.

Simple, easy set-up and operation, with fast, accurate performance.

Repair parts — readily available — no factory service men needed for repairs.

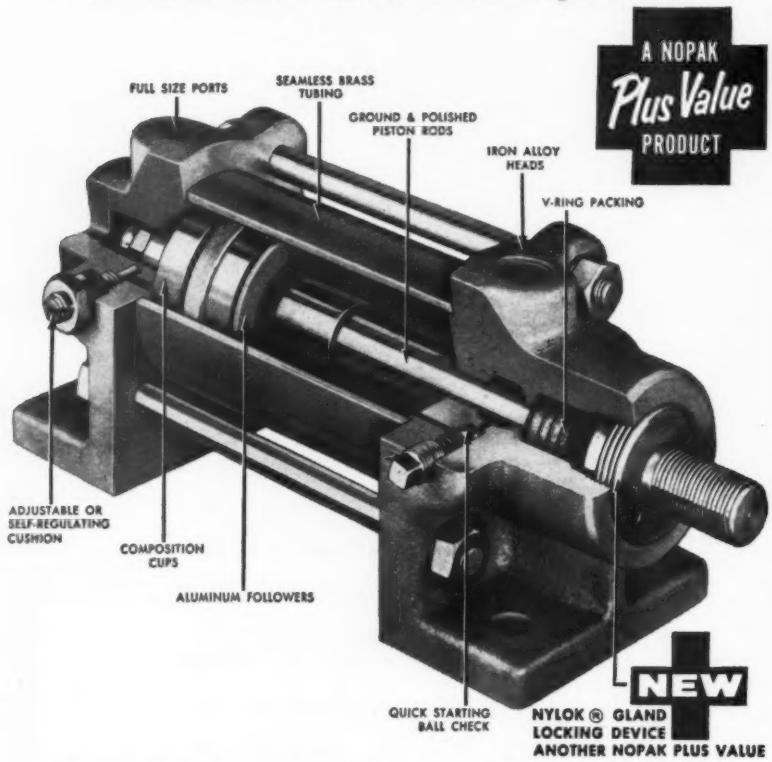
CAPCO PRODUCTS DIVISION

P.O. Box 507 Columbus 16, Ohio Phone: AMherst 8-3581

CIRCLE INFORM-A-GRAM KEY NO. 41

Plus Value Performance

is built into NOPAK Air Cylinders



Class 1 and 2 Air Cylinders

Pressures to 250 P.S.I.

Features? Check These—

- **CHOICE OF CUSHIONING ACTION:** All Class 1 and 2 cylinders are available with non-cushioned, self-regulating or adjustable cushioned heads on either or both ends.
- **QUICK STARTING:** Quick opening ball-check valve assures starting under full power.
- **LIGHTWEIGHT COMPONENTS:** Piston follower and follower-ring made of aluminum, wherever suitable, reduce piston weight up to 60%, result in faster starting, more power, longer cup-packing life in horizontally mounted cylinders, reduced impact.
- **PISTON PACKING TYPES:** Standard piston assemblies utilize dependable composition self-sealing cups, for air, oil or water service. Other types available include:
  - Leather cups for medium and low pressure
  - Impregnated fabric cups for high pressure oil or water
  - Graphite impregnated cups for high temperatures
  - Piston-ring type for special applications
- **SELF-LOCKING PACKING GLAND:** New gland design utilizes Nylok ® for positive locking.
- **SELF-COMPENSATING V-RING PACKING:** Requires no adjustment; assures longest possible trouble-free operation.
- **BRASS TUBING:** Hard drawn, seamless, straight and concentric; impervious to corrosion.
- **CYLINDER HEADS:** Iron Alloy for durability and long life.

Shelf-Stock Service on Standard Models

NOPAK Class 1 Self-Regulating Cushion Air Cylinders are available from stock in a range of bore sizes and stroke lengths from 1½" x 1" to 8" x 15" in 6 Standard Models. Ask your NOPAK representative for the latest NOPAK Shelf Stock listings, or they will be sent with your request for Catalog 101-A covering the complete line of NOPAK Air Cylinders.

® Registered Trade Mark, The Nylok Corp.

Representatives in Principal Cities

NOPAK *VALVES and CYLINDERS*

Galland-Henning NOPAK Division • 2782 S. 31st Street • Milwaukee 46, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 42

MANUFACTURING MEMOS

Hard On Tools

Turnover in cutting tool designs for machining uranium compounds will be 72% greater than those used for machining conventional metals says Kar Fisher, Super Tool Co. prexy. These designs can have as short as a 90-day-life to keep pace with nuclear material changes from month to month.

'Hotter' Line

Hevi-Duty Electric Co. has added more fuel to its sales fire by acquiring Eclipse Fuel Engineering Co. Hevi-Duty's line now includes fuel-fired heat treating, forging, and melting furnaces.

Busy, Busy, Busy

9,000,000 axles have been turned out by the Fort Wayne Division of Dana Corp. since 1946. A jump from one to 30 customers is also a big part of its past 12-year success story.

Happy Birthday

Boyar-Schultz Corp. isn't just blowing out candles for its 30th anniversary; it's introducing five new products — a new hydraulic surface grinder, a profile grinder, a lead screw tapping machine, a recessing toolholder, a "bushingless" drillholder, and a high speed deep hole drilling tool for single-spindle automatics.

Gage Hints

If you're confused about how to order thread gages, get the series of "Do's and Dont's" offered by T. J. Owen of Size Control Co., 2500 W. Washington Blvd., Chicago 12. Sizes, class, and tolerances of the gage wanted is all the data an order needs. (Tell them T&P sent you.)

Just Like New

A new repair and reconditioning plant for industrial anti-friction spindles has been opened by Whitnon Mfg. Co. in Detroit.

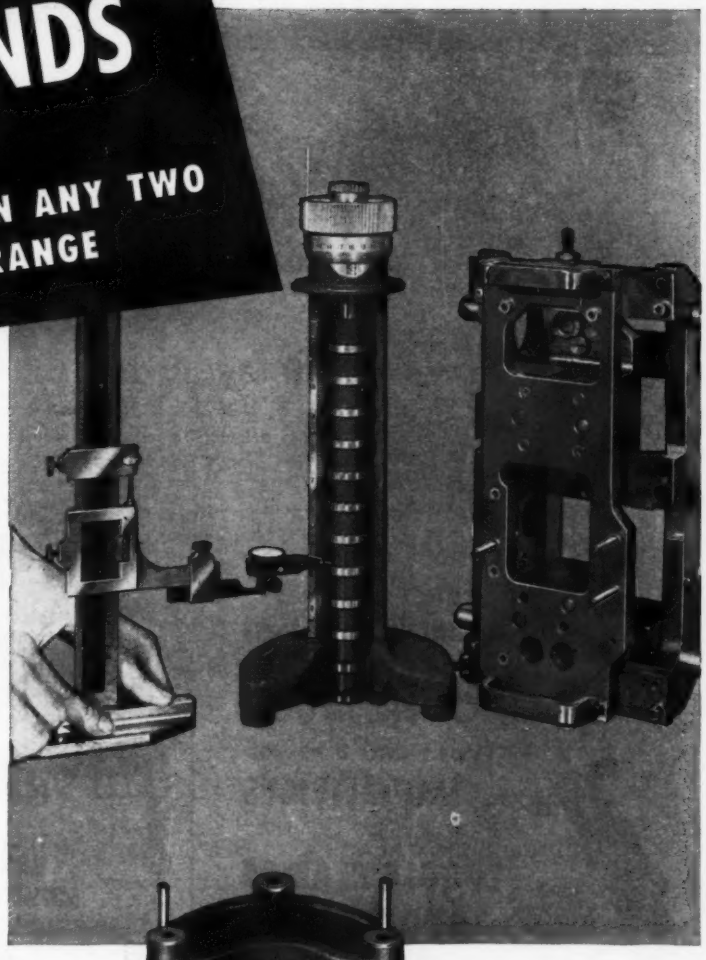
Golden Anniversary

It's a long road from being a supplier of journal bearings for railway street cars to a producer of a 10,000-item bearing line. But by "bearing" with it, Rollway Bearing Co. now chalks up

. . . *Continued on page 44*

10 SECONDS

.00005" BETWEEN ANY TWO POINTS IN 12" RANGE



Cadillac PLA-CHEK

SPEEDS ACCURATE INSPECTION from *MINUTES* to *SECONDS*

Designed for easy portability and extreme ruggedness, this 12" Cadillac PLA-CHEK takes little more than 10 seconds to set! Permits surface plate checking and inspections nearly 5 times faster than by ordinary methods.

And, accuracy is assured! Between any 2 points in the 12" range accuracy is guaranteed within .00005".

With a reverse checking plate, a height-gage indicator is easily set for checking the underside of parts. Use of inside micrometers, telescoping and internal cylinder gages gives this gage added versatility. Send coupon TODAY for complete details!

To increase the usefulness of the 12" Cadillac PLA-CHEK Gage, without sacrificing portability, this 6" precision-made riser may be used—upping range to 18".

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Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

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Company_____

Address_____

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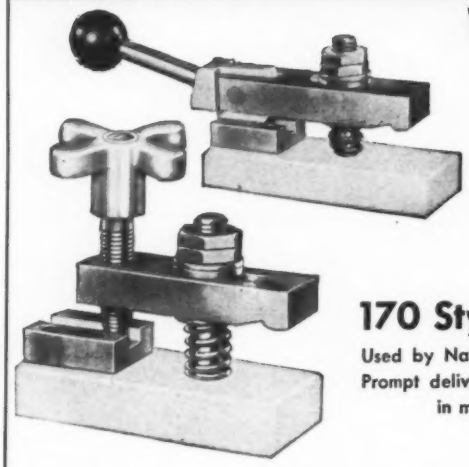
CIRCLE INFORM-A-GRAM KEY NO. 43

The Right Clamp- The Right Part for EVERY Work Holding Job



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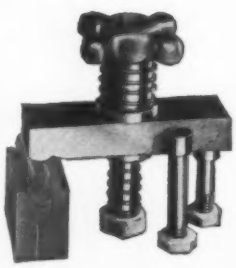
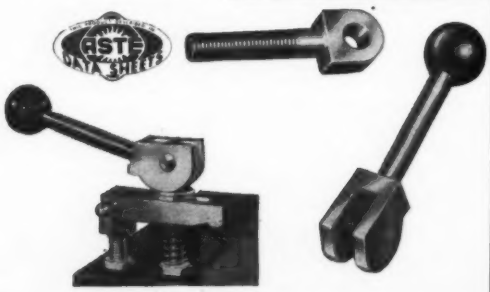




CIRCLE INFORM-A-GRAM KEY NO. 44

MANUFACTURING MEMOS

50 years of cylindrical roller bearing manufacturing. They started out producing just journal bearings.

Acquisitions

Wheelabrator Corp. has formed a new barrel finishing and wet blasting division by acquiring the assets of Crandall Engineering and Mfg. Inc. Under General Manager Jacob A. Schmidt, Jr., the division will make a complete line of barrel finishing machines.

Pressure Blast Mfg. Co., Inc. has acquired Cro-Plate Co., and the entire line of pressure blast wet blasting equipment and abrasives will be continued.

COMING EVENTS

Sept. 12-13. Society of Plastics Engineers Inc.'s Regional Technical Conference, St. Clair Inn, St. Clair, Mich.

Sept. 14-19. Instrument Society of America, 13th Annual Instrument Automation Conference, Exhibit, & Computer Clinic. Convention Hall, Philadelphia.

Sept. 16-18. Electronic Industries Assoc.'s Fall Meeting, St. Francis Hotel, San Francisco.

Sept. 19. 5th Annual San Francisco Bay Area Quality Control Conference, Stanford University, San Francisco.

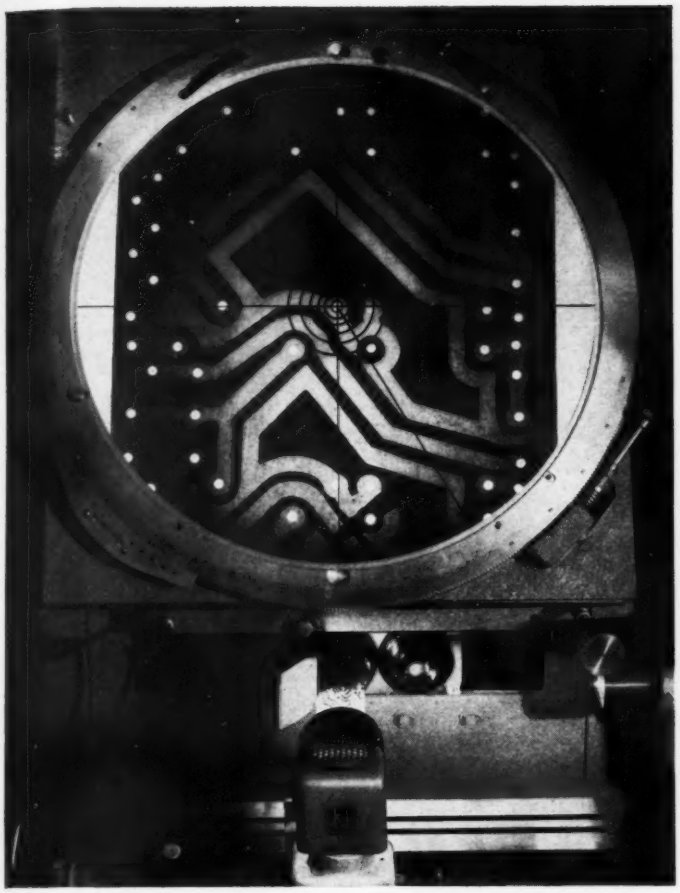
Sept. 23-26. Association of Iron and Steel Engineers' Convention & Exposition, Public Auditorium, Cleveland.

Sept. 28-Oct. 2. Pressed Metal Institute's Annual Executive Meeting, Cloister, Sea Island, Ga.

Sept. 29-Oct. 3. American Society of Tool Engineers' Fall Meeting & Western Tool Show, Shriner Exposition Hall, Los Angeles.

Sept. 29-Oct. 3. Society of Automotive Engineers', National Aeronautic meeting, Aeronautic Production Forum and Aircraft Engineering Display. Ambassador Hotel, Los Angeles.

Sept. 30-Oct. 1. National Screw Machine Products Assoc.'s Executive Seminar, Brock-Sheraton Hotel, Niagara Falls, Canada.



J & L Comparators are ideally suited for inspection of printed circuits — because they provide coordinate measuring facilities corresponding to the method by which circuits are dimensioned.

In mating the printed circuit with other components, it is necessary that the terminal points be located accurately. Also — to assure a uniform flow of current through the connectors, the drilled holes at the terminals must be centralized within the circuitry.

A Comparator, equipped with a surface illuminator, projects a reflected image to a chart having radii and lines. By comparing the image of the drilled holes to the radii on the chart the size and location of the holes may be determined.

True precision like this never comes cheap!

Of all the possible areas in which to economize, quality inspection is the least promising. Why?

Simply because the kind of intensive research, painstaking engineering and top-quality manufacture it takes to produce precision inspection equipment like the J&L Comparator just CAN'T be offered at bargain-basement prices. On the other hand, cheap equipment doesn't belong in the same league with a J&L Comparator when it comes to accuracy, speed, versatility and all-round dependability. When it comes to true precision of inspection, a cheap comparator can prove to be *terribly* expensive.

J&L Comparators come in 11 models, both bench and pedestal type.

"The originator of machine tool standards in optical inspection"

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 519 Clinton Street, Springfield, Vt., U.S.A.
Please send me Comparator Catalog 5700, which describes the complete line of J&L Optical Comparators.

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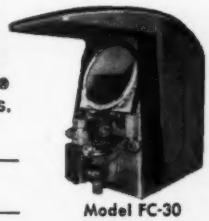


Model FC-30

CIRCLE INFORM-A-GRAM KEY NO. 45

Models 400 and 600 Erickson Speed Indexers. Standard index plate provides 4, 6, 8, 12 and 24 positions; special parts provide up to 50 positions on Model 400, up to 100 positions on Model 600. Other models available.

Angular accuracy within 2 minutes... repetitive accuracy in low "tenths" of a thousandth

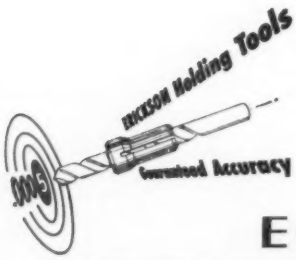
ERICKSON INDEXERS–

the economical way to smash automation bottlenecks

Even the most elaborate automatic production line can bog down *expensively* without rapid and accurate automatic parts positioning.

That's where Erickson Indexers really pay off. For you can interlock them into your production set-up with micro switches and solenoid valves. The hardened and ground lock pin operates in conjunction with the actuating mechanism to assure *positive positioning and angular accuracy within 2 minutes of a degree.* (Repetitive accuracy is no indication of angular accuracy. Erickson holds repetitive accuracy in low "tenths" of a thousandth.) And Erickson Indexers can maintain this great accuracy because their adjustable, self-contained shock control unit delivers a cushioned rotary load to the mechanism, thereby reducing wear.

Speed to keep lines moving . . . accuracy to reduce rejects . . . long life to cut maintenance and capital investment – all add up to Erickson Indexers, the *economical* way to smash automation bottlenecks.



Write for Erickson Catalog K today! You'll find many interesting applications for all Erickson holding tools. Take advantage of our free engineering service. An Erickson field engineer will gladly work with you for production economy.

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CIRCLE INFORM-A-GRAM KEY NO. 46

ELECTROLYTIC GRINDING UNLIMITED

TODAY'S BATTLE TO REGAIN PROFITS which may have evaporated due to increased labor and material costs is a struggle of minds and methods, a separation of the men from the boys.

The grinding of carbides by the electrolytic grinding process is a case in point. Here we have a well-established, thoroughly proved method in the art of shaping metal, which, however, is still new.

In view of the accomplishments that have already been attained in the diversity of its applications and what those applications imply for the future, it will be a long time before the electrolytic metal-removing process attains the status of old stuff!

The process is essentially an electrolytic plating process in reverse — "deplating", "unplating", call it what you will. Whereas conventional plating is an additive process, we can, simply by reversing the polarity of the electric current, come up with a subtractive process. Decorative plating is a metal put-er-on-er, and electrolytic grinding is a metal take-er-off-er!

Initially introduced in the early 50's, it was enthusiastically received in the carbide grinding field because of the extremely fast carbide removal and diamond wheel conservation that it effected.

As with conventional plating, the electrical circuitry in eletrolytic grinding is basically simple; involving a direct current power source of low voltage and high amperage.

The carbide tool, by virtue of resting on the grinding machine worktable, becomes the anode (electrically positive). The wheel's diamond particles are imbedded in a metallic bond which is the cathode (electrically negative) and is electrically common to the wheel's steel backing and spindle, the latter being insulated from the machine frame (which is positive).

Thus the direct current flow is: from the positive output terminal of the dc power source, and through the machine table and tool. The wheel's diamond particles, imbedded in the metal bond are, of course, non-conductors and they protrude a thousandth or so beyond metal bond or matrix.

The circulating flood of electrolyte (a la coolant) provides the electrical conducting path from the carbide to the metal wheel. From there the current goes merrily on its way through the machine spindle and back to the negative terminal of the power pack. (Please don't tell me that present day teaching of electrical current involves electrons flowing from negative to positive — I've heard tell, but I'm too old to start all over again!)

The gap in our otherwise all-metallic circuit, caused by the protruding diamonds and which is bridged by the gushing conductive electrolyte, is where the plot thickens. The carbide is "unplated" by the electro-chemical action of the combined dc amperes and electrolyte, and the carbide "sludge" is filtered and precipitated out by the electrolyte's recirculatory system.

Some 80-90% of the work done by the diamond particles is simply that of "scouring" the surface of the carbide to keep it "chemically pure" and most receptive to the electrolytic unplating action, thus tremendously accelerating the rate of removal. The diamonds are scouring, rather than making chips — hence the fantastically long life of the diamond wheels.

As noted, the dc current supplied by the power pack (ac input, step-down transformers, rectifiers, and ripple filters) is of very low (harmless) voltage (3 to 10) and very high amperage (50 to over 200), depending on the brand of equipment and the requirements of the job.

Electrolytic grinding is a relatively cold process, hence ideally applicable to jobs involving temperature-sensitive materials, such as the foil-thin edges of stainless steel honeycomb structures; it leaves no burr or lay-over.

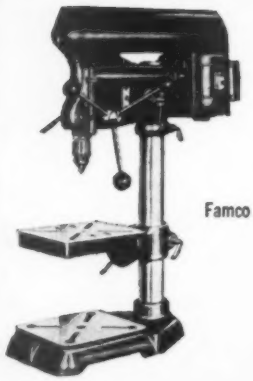
It not only creates no burrs, but where there are minute remnants of burrs in transformer lamination stacks, which sometimes are intolerable for electrical reasons, a bit of electrolytic grinding will remove them and the stacked edges become as clean as an etched metallurgical specimen.

With electrolytic work being done on hole-making, turbine blade profiling, and rocket engine fin deburring, this becomes a far cry from the processes' pioneer days of "grinding" the faces and chip breakers on carbide tools.

When you consider that this "far cry" extends over only three or four years, what can happen in the next three or four years is for you to imagine, and you'll probably be right!

E. Willard Pennington

editor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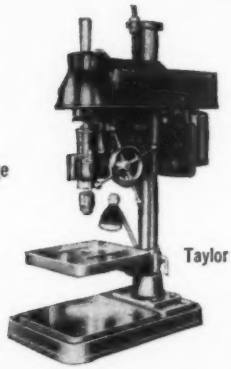
Walker-Turner

Buffalo Forge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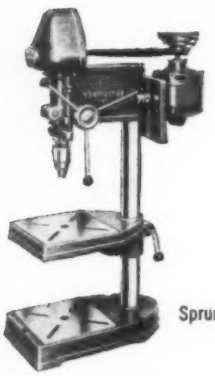
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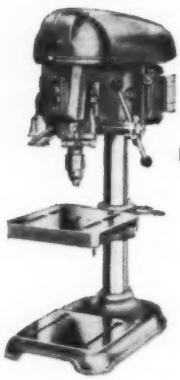
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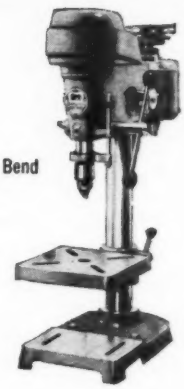
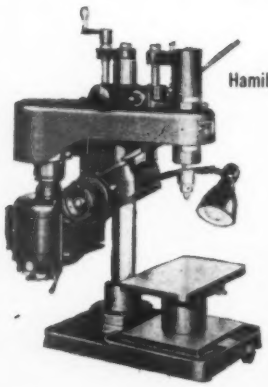
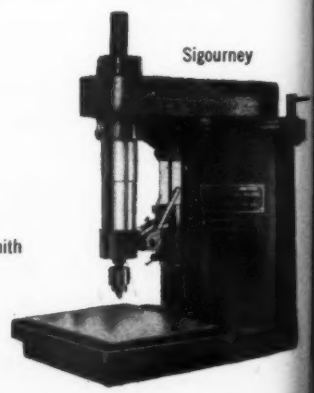

South Bend

Sears' Craftsman


Hamilton

High Speed Hammer

Shop Smith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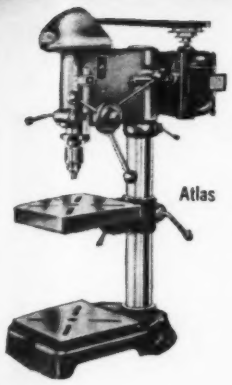
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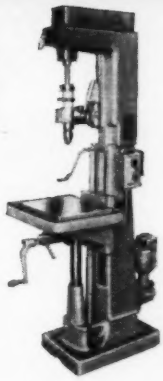
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CIRCLE INFORM-A-GRAM KEY NO. 49

"Yes this was a modern shop in 1939——but..."

Why wait for new machine tools?

Now you can buy them out of increased earnings

Planning for the future is sound policy. But if you still have old-time machines that can't compete with the newer, more efficient equipment, then the future is already here!

Lost profits can't be replaced. But obsolete equipment can—and should be replaced before losses mount higher!

The lack of "normal" cash reserves no longer forces you to wait—to put off until some future date the savings...and earnings...that can start right now. Why not take advantage of Gisholt's Leasing and Extended Payment Plans? Either one will enable you, without tying up important capital, to put these more efficient producers to work on a "pay-as-they-earn" basis...and give you a running start when you need them most.

More and more forward-looking executives are turning to our leasing and extended payment plans as the best kind of future planning.

Ask for this important bulletin

"What You Should Know About Buying and Leasing Machine Tools" is an authoritative booklet which discusses the facts about depreciation, tax angles and details of this timely subject. Use the coupon to get your free copy.

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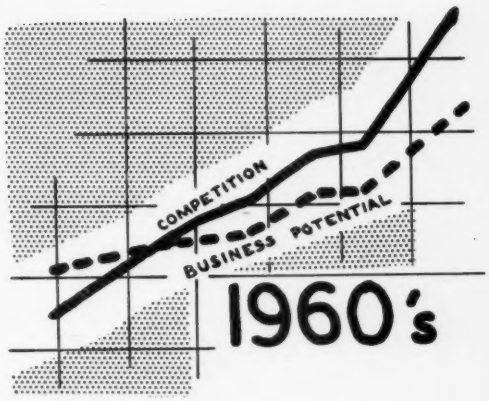


It's a good time to spend money to make money

by Carol E. Reuss
Associate Editor

TALK TO FIVE PEOPLE OR TALK to 25, not one of them will try to predict the exact month business will be booming; no one will pinpoint the exact number of dollars the American people will spend on the appliances, automobiles, and home furnishings in the six months, year, or five years to come. The business upturn will come, however, economists and business leaders agree, and so will stiff, tough competition; the kind of competition that divides the manufacturing might from the has-beens. This competition means every manufacturer will have to stretch every dollar he has to make sure it does 100 cents worth of work.

Those business prognosticators who bank on the growing population — especially that segment of the population which will be making and furnishing homes in the early 1960s — are basing their thinking on the premise that this larger population will have more dollars to spend for manufactured goods. Manufacturers, they add, will still have to tantalize these people with all the sales gimmicks they can muster, particularly high quality and competitive prices.

They don't urge plants to expand as such, however, unless sound business analysis and reasoning shows positively that their particular line will warrant additional facilities. The business brain-trusts do recommend, and recommend strongly, that every manufacturing plant be prepared to use the most modern equipment and methods available to produce high quality goods as cheaply as possible, and to do this soon. No bargain basement goods, they say, but quality at a reasonable price.

For the immediate future, the prospect is competition to stay in business and to entice the buying public to let loose of the money it has stored in bank vaults. Even though plants are working shortened weeks and employment has been down, bankers know that money is available. People have savings stashed away. What's needed now is a way to get the dollars circulating. Manufacturing money, on the other hand, is no longer tied up in big inventories; companies have money and credit available.

Competition is nothing new. For the past year and a half, especially, companies have gained or lost orders because of penny differences in bids. This will, from all indications, continue. The company which makes the best product at the lowest price and merchandizes it effectively will survive and bask in the sunshine of the boom years ahead. The rest will quietly starve themselves out of existence.

Linking present with past and future, how does this make companies want to spend money to make more? The reasons are many and some are complex. This article will at best only serve as a starting point to stimulate the manufacturer's thinking.

Dun and Bradstreet business analyst John W. Riday thinks it is to the manufacturer's advantage to examine his existing equipment for efficiency, and if needed, to invest in modernization or replacement. "Make existing production facilities more efficient," he says, "to cut operating costs." The present time, Riday believes, is the time to spend on research of new products and production methods.

Disregarding mass expansion of manufacturing facilities, but concentrating on modernization in an effort to beat the competition, ask yourself these questions: How far behind the times is my plant? Am I taking advantage of the money-saving techniques and equipment on the industrial market today?

For the past few years the ratio of the various ages of machine tools in American plants, as reported by the National Machine Tool Builders' Association, has gone practically unchanged: More than 23% of the machine tools are 20 years old or older and more than 65% are 10 years old or over.

Bell & Howell's Experience:

New Products
at
Reduced Prices
means
More Sales
and calls for
Expanded Facilities
and
Most Economical Equipment
to
Make Profits

Therefore: The company spent 67% more for capital equipment this year than last.
Comparing the first quarter of this year with the first quarter of 1957, says B&H President Charles H. Percy, the company shows a 21½% gain in sales, a 23% gain in net earnings, and a 4½% gain in total employment.

Suppress that tendency to get bored at these figures and look at the situation this way and notice how different your machines look, how much differently they line up as profit-makers: Are your machines producing parts at the cheapest possible cost? Do they cost you money by using more stock in producing parts than modern machine tools do? Do they require two operations to complete a part, where one would do with a newer machine? Do they permit you to use carbides? . . . ceramics? . . . automatic controls? Do they use as little expensive manpower as possible? Do they call for excessive maintenance?

Add your own question to complete your list. It all boils down to the well-known fact that survival and profits depends on making the most out of your equipment . . . doing the job at hand under the best possible conditions.

If your equipment's modern, in top-notch shape, more power to you. If not, the present recession-time is an excellent time to investigate what's available, decide what's best for your purposes, and invest, provided you have adequate proof of the need for the equipment. It would be foolish to spend thousands of dollars if the machines aren't needed . . . to spend thousands of dollars to mass-produce button-hooks, for instance, when we know that high-buttoned shoes went out with the bustle.

TOOLING & PRODUCTION asked a representative group of top businessmen if they'd recommend buying now to meet tomorrow's competition and the business boom still in the future. Collectively, their answers show a big "yes," and highlight these points:

1. It's vital to be able to produce a product at the lowest possible price consistent with the high quality demanded of it.

Jones and Lamson Machine Tool Company's new film, "The Price of Eggs," dramatizes this most effectively. If a farmer offered three one-dozen boxes of the same size, same quality, same freshness eggs for three different prices, they reason, you'd think the farmer is tetched and you'd buy the cheapest. If the same manufactured part costs three different prices because it was produced on three different machines of varying ages and accuracies, you'd produce the part on the most economical machine . . . choose the cheapest method of manufacturing it. Modern machine tools can enable the part maker to produce cheaper and make bigger profits. They cannot be compared with their 20- and 30-year-old ancestors. When accuracy and competitive price are important — and both are today and will be tomorrow — the modern equipment wins hands down, even though, as many say, "this 30-year-old lathe's still making chips." (It may be making chips, but how about the part it's supposed to be shaping?)

Walter K. Bailey, president of the Warner and Swasey Company puts it this way: "The time to replace obsolete machine tools is right now — before your competition does it and gets the jump on you." He sights the example of a bearing manufacturer who kept putting off any modernization moves. When his competition showed him, by taking some $100,000 worth of business from him, that modern equipment could cut costs, the manufacturer finally changed his mind and modernized to survive.

2. The price is right—both for new equipment and in terms of financing new machinery.

The machine tool builders this summer hit their lowest sales point in years. This coupled with the fact that their productive capacity is the greatest in history, means they're dealing to sell. They're willing and

NOW, TO GET YOUR MODERNIZATION PLANS ACCEPTED . . .

RECOMMENDATIONS FOR NEW EQUIPMENT, a change in a process, or what have you won't get to first base with the Boss — whether it be the Board of Directors, the company President, the Divisional Manager, or your immediate supervisor — if they aren't prepared and presented carefully.

Borrowing from the experience of Donald H. Sunderlin, a management consultant who's had to "sell" his ideas and his services to many a "tough" industrialist, here are some things to consider before presenting your case:

"Preparation is very important and if it is done correctly, the outcome is almost assured," says Sunderlin. Your attack must be planned from the "buyer's" point of view, he adds, remembering that the higher his position the broader his vision. Presidents think in terms of plant modernization; they do not buy machine tools as such. Master Mechanics are more interested in performance and mechanical details. Here is Sunderlin's "Preparation Check-List":

- Decide whether suggestion would be preferable to argument; a casual reference better than a formal presentation. Some executives more readily grasp a thought when it is casually offered.
- Check your idea in advance with a well-qualified individual who knows the background. He may be able to point out a weak spot in your plan or show you how to slant your approach to suit the desires of the one you are trying to convince.

able to analyze production problems with prospects, offer their services for both part and production improvement, and get modern efficient equipment into manufacturing plants. In short, they want orders, and are willing to overlook price increases for the present time, even though the expected increase in steel prices and labor costs have already come. But, you can bet your bottom dollar that when they have enough business to comfortably fill their books, they'll stop absorbing price increases and machine tool users will pay the difference. Some of the machine tool builders questioned by TOOLING & PRODUCTION hint of a small price increase yet this year; others, a boost from 5% to 20% by 1960.

What about paying for such equipment? Here too, the price is as right as it will ever be, most economists agree. Banks have money on hand for capital equipment loans. The Federal Reserve has literally pumped loanable money into member-banks, and interest rates have remained as low as they'll be for some time. Here too, when the demand for loans increases, money will be harder to find, rates will be higher.

If bank financing isn't what you want, financial houses such as the C.I.T. Corporation have borrowing plans that might suit your needs, as have many machinery manufacturers.

Money will be readily available until 1960, Cleveland's Central National Bank economist, R. L. Metzner, believes. After then, manufacturers will have to look harder for money and credit.

They Tell Us . . .

"Those who can decide now what they want and need and get it ordered, will be busy producing at a time when their competitors will be busy using every method known to expediters to put pressure for delivery on machinery builders."

—C. R. Rosborough, President
Moline Tool Company

". . . introduction of more efficient tools and methods will keep productivity abreast of the inflationary trend."

—W. E. Rentz, Executive Vice President
Giddings & Lewis Machine Tool Co.

"It has been estimated that the ratio of the available working force in 1960, to total population in 1960, will be lower than at the present time. This means an ever-increasing demand for higher productivity per worker."

—W. C. Denison, President
Denison Engineering Division
American Brake Shoe Company

3. Delivery time, installation, and service are in the buyer's favor.

For most standard stock machinery, delivery is immediate. For special machinery, builders report the shortest delivery time in years. Their men are available for quick and complete installation and debugging. They go so far as to offer the most complete training programs for machine operators in years, and many give more thorough attention to helping machine tool users perfect improved manufacturing techniques.

If everyone waits until the economy is on the way up, however, delivery as well as price can and will be at a premium. Attention to little details will be overlooked in an attempt to service the clamoring crowd of buyers. "There is an evident pent up demand for capital equipment," one business leader told T&P, "which will break loose as business improves. It may be difficult for companies to obtain the needed equipment in time for their requirements if they wait," he adds.

4. You can afford to "shop around."

It's always wise to compare with your specific needs the equipment that's available. With business slow at the present time, multi-man "shopping teams" can be assigned the job of investigating needs, ways, and means. Builder and user time and talent can be utilized to draw up coordinated modernization plans and determine exact requirements.

A large electric motor manufacturer had some money available from a previously allocated modernization and expansion program. Even though the company was suffering from recession blues, its people looked around to find a way to use the available money for future productive needs. After discussing the

• Check on other applications of the idea so you can point to previous success under somewhat similar circumstances.

• Be prepared to explain how any new problems which may be created by the adoption of your idea, will be met.

• Select a secondary target "so that your bombs won't have to be carried home in case the primary objective cannot be reached."

The actual presentation of the idea, Sunderlin says, should follow this pattern:

• Explain in a *few words* what you are attempting to accomplish and why it is desirable. Follow up with a *brief* explanation of how you propose to attain the objective. Your man then has a general concept of the proposal. The balance fills in details and suggests action.

• Try to illustrate your plan strikingly. Charts and pictures help.

• Be patient. Everyone requires time to orient his thinking to a new set of circumstances. Be clear, and considerate, but don't allow yourself to be placed in a defensive position.

• Try to gain preliminary acceptance on a small scale if the whole package cannot immediately be sold.

• Take general acceptance for granted and describe the idea in action.

• Ask for a decision if the climate appears favorable. If you see that the response will be negative, leave the door open so the subject can again be brought up after revisions have been made.

matter with a machine tool builder they were shown a new and better method for producing the parts they had in mind, courtesy the builder. Their management was so convinced of the value of this new method, even though the equipment cost more than they originally had in the till for the project, that they soon allocated the additional money and are now producing a better part, easier and cheaper. They're now handling present orders efficiently and are prepared for the time when their motors will again be in great demand.

5. There's no immediate hope for a change in tax laws or the government's depreciation rates.

Although some very minor changes may be made, they should have no material effect on decisions to purchase new equipment. If modernization of productive facilities is justifiable for reasons of meeting competition or just plain being able to make the products, such things as depreciation rates should be of no great consequence. The best thing to do is find the tax and depreciation methods and schedules of most benefit to your particular firm. That's the accountant's job.

6. It's possible to upgrade and even modernize sufficiently by obtaining good rebuilt equipment that isn't too old, and by installing attachments such as automatic feeders to existing equipment.

Opinion is somewhat divided as to where to draw the line on the value of rebuilt equipment and accessories for existing machines. For the small plant that's been coaxing 15-year-old machines along, the acquisition of a rebuilt 5-year-old machine surely means progress. For the large mass-producer, such purchases have to be evaluated very carefully, and usually the best conclusion would be purchase of a fully-modern new unit.

Careful selection of standard attachments and accessories extend the usefulness of present equipment as well as new equipment. Where production requirements warrant, special handling and gaging devices, for example, will add materially to the quality and number of pieces produced. Some such accessories can be money down the drain when their acquisition and addition gives just temporary relief and little long-term productivity and profit.

The need and opportunity to modernize isn't just a promotional brainstorm of machine tool builders. It's a real problem that must be met, and can be met profitably right now. The Monarch Machine Tool Company sets itself up as an example:

"We use our own lathes in building lathes," Monarch President Jerome A. Raterman relates, "so this summer we undertook to replace every old Monarch lathe in our shop with our newest models.

"The lathes we discarded were not old in the physical sense of the term — in fact, the average age of all machine tools throughout our plant is less than ten years. This meant that we could rebuild and sell these lathes as used but serviceable machines to many customers whose needs would perhaps never justify the purchase of completely new equipment.

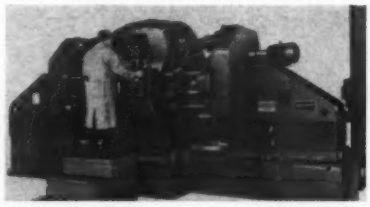
"The rebuilding of the lathes at this time when we were not exactly overwhelmed with business would give our people many hours of work not otherwise available. Moreover, we realized that we have been telling customers and prospects that the time to replace obsolete machines was *today*, in order to get set for the production requirements of tomorrow. What we did, in principle, was simply to take some of our own medicine!"

That's a good example as well as good advice. **end**

SHORT-RUN AUTOMATIC MACHINES DEVELOPED FOR SETUP EASE

Ease of setup is the main design feature of a line of Buhr Econamatics developed for machining many different parts having a family resemblance. A typical machine drills, bores, reams, taps, and chamfers 36 hydraulic valve bodies of different sizes and having holes of different sizes in various locations.

These machines are assembled from standard Buhr Machine Tool Co. building-block components but each has a control circuit tailored to the family of parts to be machined. Basically, the machines are double-end trunnion-type Econamatics with two horizontal hydraulic-feed units. Both heads go through standard cycles of rapid advance, coarse feed (either of two or more rates), fine feed, positive stop, dwell, and automatic reverse. Most of the spindles are grouped in standard "pot" heads but added location flexibility is achieved by also using indexing pot heads.



A standard multi-position trunnion unit is mounted between two upright supports and it is equipped with a standard horizontal indexing unit. The first machine has a 10-position trunnion with nine working stations and 10-workholding fixtures. Workpieces are manually loaded and clamped in the fixtures.

To initiate the automatic work cycle, the operator loads and clamps workpieces in the fixture at the load station and presses two index push-buttons. The trunnion indexes one station and the heads automatically start their cycles. Interlocks protect the machine and the operator.

Realizing that tooling setups would be changed many times during the life of this machine, Buhr put all the tooling data — data that had to be collected before the machine and tooling could be designed — on spindle-layout sketches. One sketch identifies all the spindles and tools for one head used for production of one part. Since there are 36 parts, there are 72 sketches. These are conveniently bound into a handy 9" x 12" book.

All spindles are shown on the sketches by circles. Where the spindle is to be tooled for production of a specific part, the circle is filled in. The setup man can see by inspection which of the spindles require tools. Tables are included on the drawings to indicate which tools are to be used. In addition to tool numbers, bushings and bushing sub-plate numbers are also tabulated. The setup man compares the drawings for the setup that has just finished producing a part with the new setup drawing and can quickly determine what tool and setup changes are required.

MAGNETIC TEST ACCURATELY COMPARES HEAT EXTRACTION PROPERTIES OF QUENCHING MEDIA

Quenchant speed measured by time required to cool a metal to its Curie point.

by Edward A. Bender
and
Harry J. Gilliland
Process Development Staff
GENERAL MOTORS CORPORATION
Detroit, Michigan

A problem which has plagued heat treaters for years has been securing the correct rate of quenching to meet the specifications of various steels used in industry. Engineers of the Process Development Staff, located at the GM Technical Center, have devised a *magnetic quench test* to compare the heat extraction properties of quenching media. This test measures the time required for a medium to cool a metal to its Curie point, where it then regains the magnetic properties which it lost through superheating. The test has given excellent results, and a portable apparatus is now being developed. The equipment also can be used to investigate the heat extraction properties of other substances, such as cutting fluids.

We are indebted to the editors of General Motors Engineering Journal for permission to present this feature. E.W.P.

ONE OF THE MOST IMPORTANT REQUIREMENTS in the heat treatment of steel is that of extracting heat from the metal so that desired physical properties are obtained. This process of heat removal is more commonly referred to as quenching, and the attainment of the desired rate of quenching to meet the specifications of various steels used in industry has plagued heat treaters for years. Engineers of the Process Development Section of the GM Process Development Staff, recognizing the need for a method to compare accurately the heat extraction properties of the numerous quenching media available on the

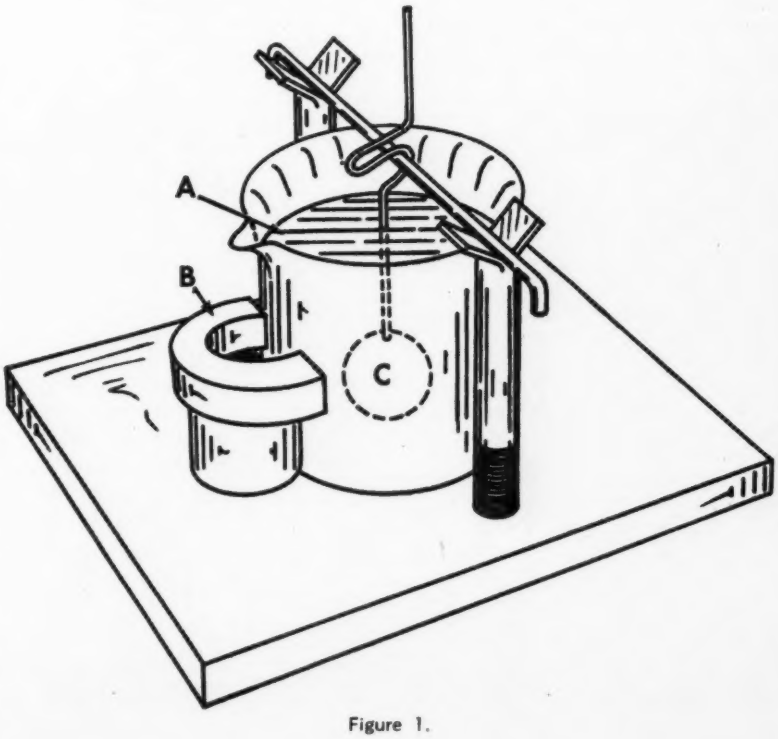


Figure 1.

Fig. 1. The original magnetic quench test stand apparatus was comprised of very simple components. The oil sample was contained in a beaker A, which was placed in the field of a permanent magnet B. The heated nickel sphere C was suspended in the oil. When the sphere cooled to its Curie point, it was drawn to the magnet at the side of the beaker.

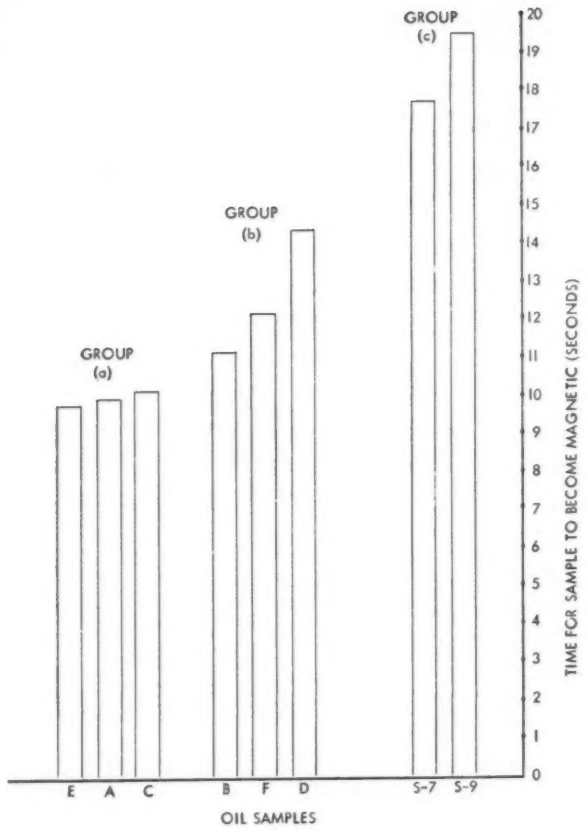


Figure 2.

Fig. 2. This graph illustrates the time required for each oil sample to cool the nickel sphere to its Curie point. A nickel sphere having a mass of 50 g was suspended in 200 cc of coolant at room temperature. The oils in groups (a) and (b) are premium oils. Two straight mineral oils comprised group (c).

market today, devised the **magnetic quench test.** This test makes use of the property of certain metals to lose their magnetism when heated above a temperature known as the Curie point and to regain it when cooled below this temperature.

Any magnetic material having a suitable Curie temperature can be used in the test. In preliminary work, various steels were investigated by Process Development engineers; however, pure nickel was selected for repeated testing because of its non-scaling characteristics and its resistance to cracking upon continuous re-heating and quenching. The use of pure nickel precludes the requirement of an atmosphere controlled furnace, if such equipment is not readily available. As a result of extensive experimentation, the nickel for use in the test was made into a sphere with a diameter of 7/8" and a weight of approximately 50 grams (Fig. 1).

The magnetic quench test was performed by heating the nickel sphere to 1600°F, either in air or a controlled atmosphere. (So that data could be obtained and correlated under varying conditions, nickel balls were run without protection, with endothermic gas, and in a nitroneal atmosphere of low hydrogen content.) After uniformity of heat was obtained at 1600°F, the nickel sphere was quenched in the oil sample under test, which was within a magnetic field.

The time required for the nickel to cool from the furnace temperature to its Curie point, at which instant it is attracted by the magnet, is a measure of the heat extraction power of the quenchant. The Curie point of pure nickel is 670°F, a temperature which occurs below the nose of the familiar "S" curve in the isothermal transformation diagrams for most steels.

Test Method Results Substantiated by Hardness Test Checks

To evaluate the test method, six premium oils, two straight mineral

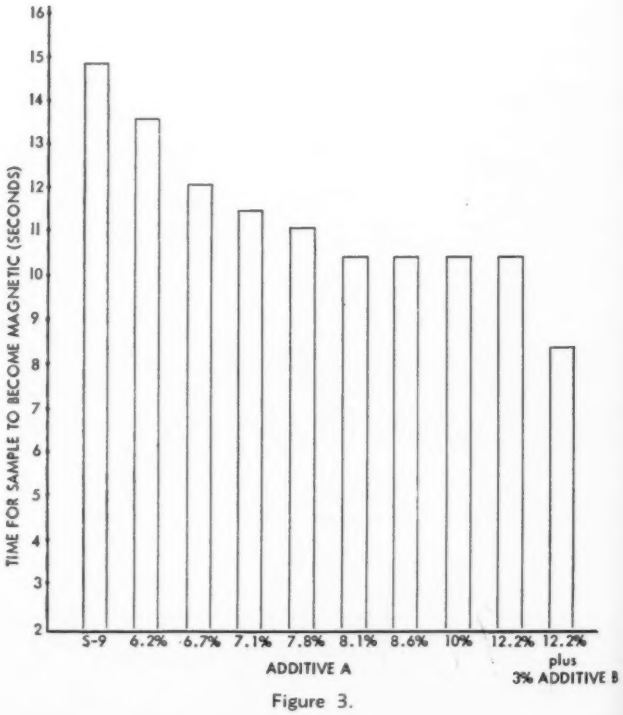


Figure 3.

Fig. 3. The effect of an additive to improve the heat extraction properties of S-9 mineral oil showed that any additions of additive "A" in excess of 8.1% did not increase the quench speed, except when a second additive "B" was added. This test was conducted with a nickel sphere of 40 g mass and an initial volume of 180 cc of still oil at room temperature.

Fig. 4. Shown here is the comparative hardness at the surface and center of S. A. E. 1046 steel bars quenched in various premium and mineral oils, under both still and agitated conditions. This particular test was performed to correlate results found by the magnetic quench test.

oils, and the same mineral oils with special proprietory additives were used as samples for comparison. The premium oils were identified by the symbols A through F, and the mineral oils by their commercial designations, S-7 and S-9. A volume of 200 cu cm was used for test purposes.

The oils were evaluated by measuring the time required for the standard nickel ball to regain its magnetism. Thus, a direct comparison was readily obtained: the faster the quenching speed of an oil, the shorter the time required for the nickel to regain its magnetism. Good test results were established by several hundred repetitive tests in still oil at room temperature (Fig. 2).

The classification of the oils and their relative quenching speeds has been substantiated further by agitating the oils up to a velocity of 300 fpm and heating them to a temperature of 130°F.

The magnetic quench test also was used to study the effect of special proprietory additives to straight mineral oil (Fig. 3). Additions in excess of 8.1% of the proprietory compound used did not increase the quench speed of the oil, except when a second compound was introduced. However, the ultimate speed did not reach that exhibited by the best premium oils. At the time the tests were conducted, a 40-g nickel sphere and 180 cu cm of quench oil were being used. Thus, another advantage of the magnetic test was realized — all results will be relative so long as the nickel specimen and oil sample volume remain constant.

Fig. 5. To simplify the magnetic quench test method and eliminate human error in testing, Process Development Staff engineers developed the **Magnetic Quenchometer** shown here. A timer A is actuated by a photocell located in the photocell housing B, when the nickel sphere C passes through the housing bore into the cage D. The cage holds the sphere in the oil sample container E. When the cage and sphere are attached to the side of the vestibule F, which contains the quenchant sample, the timer is shut off. The cage is supported by a yoke G, which is held by two, rod end aircraft-type bearings H. The interval recorded by the timer is a measure of the cooling ability of the quenchant sample.

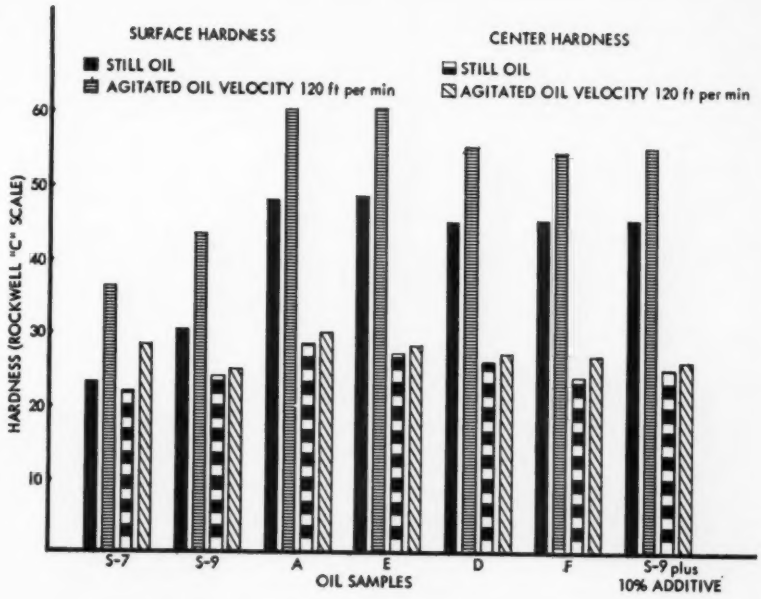


Figure 4.

METHOD OF TEST	CLASSIFICATION WITH DECREASE IN SPEED	
	Premium Oils	Straight Mineral Oils
Magnetic Quench	E A C B F D	S-7 S-9
As-Quenched Hardness	(E A) (C B) F D	S-9 S-7
Test A	F E D C A B	S-9 S-7
Test B	(F E) C (A D) B	(S-9 S-7)

( ) Indicates oils gave identical results

Table I. Summarized here are the results of three different tests performed to compare the quenching powers of premium and straight mineral oils. The results indicate the consistency of the magnetic quench test, when compared to the as-quenched hardness, and the inconsistency of the two commercial test methods A and B. The quenching speed of the various oils decreases from left to right.

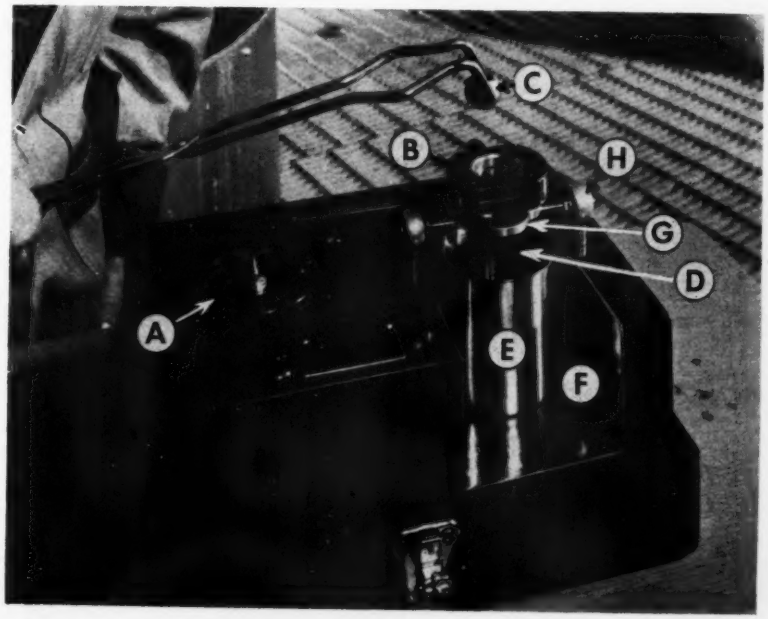


Figure 5.

Because of the importance of correlating magnetic quench test results with operating practices, transverse hardness tests were made on S. A. E. 1046 steel quenched in the various oil samples. The test bars were ⅞" dia and 3" long, with two surfaces 180° apart that were ground flat prior to heat treatment to obtain accurate surface hardness measurements.

The test pieces were austenitized at 1500°F in an electric furnace with an atmosphere of endothermic gas. Quenching was performed in two liters of oil, both still and agitated with an oil velocity of approximately 120 fpm. Each test bar was sectioned and transverse hardness checks were made (Fig. 4).

Excellent correlation was found to exist between the properties of the oils as shown by the magnetic quench test and the surface and center hardness test.

The magnetic quench test also was compared with two commercial test procedures used in industry today. As a result of exhaustive tests, the following conclusions were drawn (Table I):

Results of the two commercial tests did not correlate with the transverse hardness tests.

Results of the commercial tests were not reproducible.

One of the commercial tests is difficult to perform because it requires two operators.

Principle Can Be Applied in Several Ways

An electrical device has been developed by the Process Development Section for use by other organizations. This device, the **Magnetic Quenchometer,** simplifies the method of test and eliminates ese element of human error in repeated testing (Fig. 5).

Another device consisting of two coils, a balanced bridge network, an amplifier, and an electric timer is being studied for portable use in production quenching systems. This device will facilitate a true test of the quench oil under actual operating conditions.

Conclusion

The magnetic quench test is not limited to tests of oil alone. It also can be utilized to evaluate the heat extraction rates of gases and salts, the inhibiting effect of sludge build up, the effect of the surface condition of heat treated parts on quenching, and the inhibiting effect of salts adhering to the piece upon quenching. An evaluation of cutting fluids is another field within the scope of this test.

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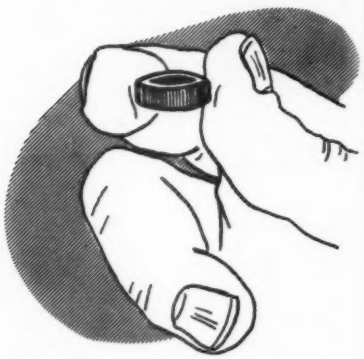
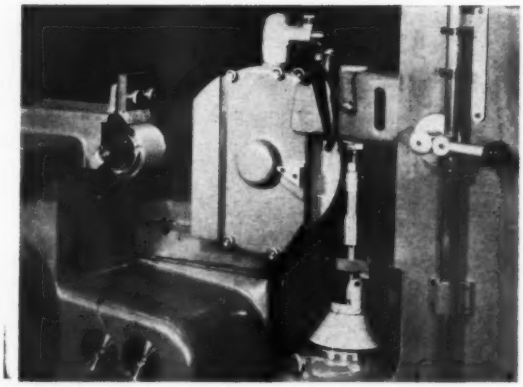


CRUSHTRUE MAKES IT SO



Gears have been ground before, but to our knowledge no one has heretofore ground gear teeth to a pitch finer than 120 teeth per inch of diameter. The new Matrix No. 61, Fine Pitch Gear Grinder, distributed by the Sheffield Corporation, is capable of grinding minute gear teeth *from a solid* by the CRUSHTRUE process. Here is a small gear of approximately a half-inch in diameter whose periphery carries 96 teeth ground by this machine. An eyepiece is necessary for inspection.

A grinding wheel, similar to a large diameter hob or worm, is used which carries the basic rack-form in its periphery. The form is "crushed" into its face by CRUSHTRUE rolls supplied by Sheffield. We understand it's quite a feat to make rolls capable of producing gear teeth to 200 DP; and then it's another trick to transfer the roll form to the grinding wheel.

The Matrix Grinder is a full generating, continuous indexing machine that insures fast production. It is capable of grinding spur gears from fine pitch specifications, ratchets, involute splines, serrations, and other generated forms.

"Vital statistics" (like Miss America) are:

Maximum pitch	16 DP
Minimum pitch	200 DP
Maximum dia of work	6"
Minimum dia of work	0"
Maximum length between centers	9"
Maximum length of teeth ground	3"
Feed per rev. of work	0.001" to 0.012"
Net weight	4000 lbs
Grinding wheel, new	8" dia
Grinding wheel, used up	6" dia
Floor space occupied	70" x 70"

Missile men, instrument men, and others using fine pitch gears will want to see this machine and know of its capabilities.

—W. E. H.

VALVE BODY PRODUCTION ON THE HEAVY DUTY TURRET LATHE

by Ernest J. Henkel
Tool Engineer
GISHOLT MACHINE COMPANY
Madison, Wisconsin

VALVES PLAY AN IMPORTANT PART in the smooth, efficient operation of the modern industrial plant. Because they are relied upon to function correctly under all kinds of operating conditions, particular care must be taken in manufacturing to assure that all tolerances are closely held and all surfaces finished to the desired smoothness for a long, dependable, trouble-free service life.

Heavy duty saddle type turret lathes offer many advantages to the valve manufacturer. Basic tooling flexibility combined with proper accessories such as the cross feeding hexagon turret, full length lead screw threading attachment, tracing equipment and special work-holding fixtures, permit appreciable reductions in production costs and, at the same time, simplifies the machining of these complex parts. They have been successfully applied to the machining of these various types of valve bodies of carbon steel, stainless alloys, cast iron and of non-ferrous materials.

The dimensional nature and weight of large valve body castings necessitates a substantial amount of handling time. Each handling requires considerable manual energy and operator attention. Limiting the number of handlings and reducing the physical energy requirement per handling have become mandatory objectives of the cost analyst in the valve shop.

The gate, globe, swing-check, pipeline and plug valve bodies, whether for water service, gas, steam, petroleum products or chemical applications, present similar silhouettes in section. It follows that many common denominators exist in the machining operations on valve bodies, regardless of size, type or material. Holding methods commonly employed range from relatively simple face-plate fixtures to large, more complicated, indexing-type fixtures that permit machining an entire valve body in one chucking. In tooling-up for any given type of valve body, the tool designer must decide which method can be used to best advantage, based on the size of the part, its physical shape, the material to be machined, the production and accuracy requirements and the equipment available for the job. Recent applications of improved carbide cutting tools, and ceramics to a limited extent, have increased emphasis on rigid chucking and improvement of balance in holding fixtures, for the higher speed operation offered by the modern, heavy duty saddle type turret lathes.

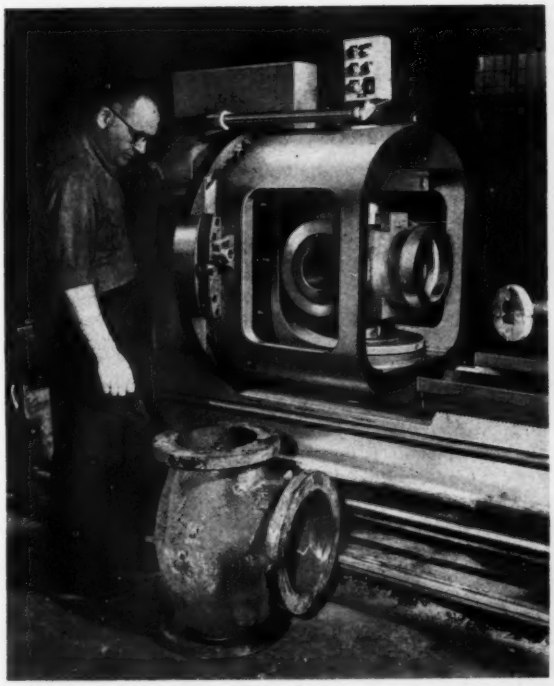


Fig. 1. Close-up of direct-loading, six-position indexing fixture that will accommodate nine valve body sizes of three types of valves.

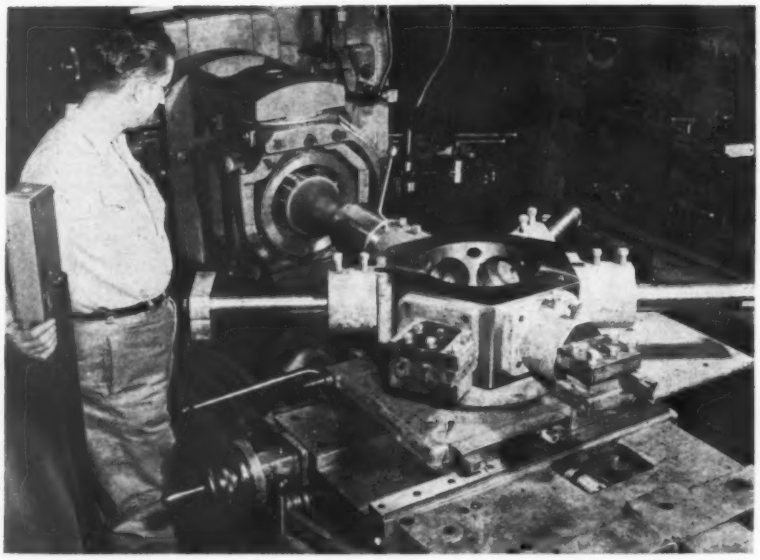


Fig. 2. Box-type or bench-loading fixture requires duplicate sets of boxes to provide for loading one fixture while the other is in the machine. Note floor stand, mounted control station at left.

The Multi-Position Indexing Fixture

The multi-position fixture, having two, three, four, five or six machining positions has been successfully adapted to valve body machining on sizes up to and including the 12" — 150 lb. cast steel gate valve body and on castings having a rough weight in excess of 700 lbs.

Employment of the multi-position indexing fixture on the heavy duty saddle type turret lathe offers a prominent example of the reduction in handling time accomplished by performing all operations in a single chucking of the work.

An outstanding illustration is the application of a direct-loading, six-position, set-over type indexing fixture, Figure 1, to the production of nine sizes and three types of valves, including gate, swing-check and pipeline bodies. The six separate machining positions include four at 90° and two angular, set-over positions that provide "built-in" accuracy between related surfaces.

The angular positions are duplicated each side of center for gate and check valve bodies. Duplication of the angular settings for check valves, saves considerable time and part rejects by eliminating the necessity for the operator to remember "which side up" when loading as he may obtain the required fixture offset by sliding in either direction on the dovetail back plate.

Lever operated taper locking pins provide the most rapid and satisfactory method for locating in the four 90° index positions associated with facing the flanges, bonnets and rest rails. Angular tolerances for seat ring boring and threading in the gate valve body are easily held with a tapered eccentric pin located in the same locking pin bushing for each seat angle, automatically establishing the identical angularity from the centerline. The single replaceable eccentric pin simplified correction of possible error due to wear.

Roller bearings installed at the indexing jaw spindles permit free indexing, even under extremely high chucking pressures. A permanent tie bar, cast integral with the fixture body, prevents the fixture deflection or "bell-mouthing," commonly associated with the "U" type indexing fixture body. The permanent tie bar replaces the hinged or removable tie bar frequently used on "U" type indexing fixtures to obtain the rigid chucking necessary to facilitate rapid metal removal.

Box-Type Fixture

"Bell-mouthing" is also avoided in the common box-type, Figure 2, or bench-loading type fixture. This fixture design requires duplicate sets of boxes or cradles in which the work is securely loaded at a work bench adjacent to the machine. While the box-loading fixture is a solution to "bell mouthing," the primary purpose of this indirect loading type fixture design is more often associated with correction for excessive core shifts resulting from booking the cope and the drag in the foundry.

The loading bench for this purpose is equipped with a centering fixture, used to locate the valve body cores between centers while the valve body is being clamped in the box. The chief objection to this indirect loading method, is the prerequisite of a helper to load and unload boxes or the sacrifice of machine down-time and consequent lost production, while the machine operator performs this same task. Since most valve shops presently tolerate core shifts up to $\frac{3}{32}$" on the 10", 150 lb. gate body, the direct-loading multi-position indexing fixture is the preferred method as compared to the time-consuming box-loading type fixture.

In addition to the reduction in loading time and manual effort, multi-position indexing type fixtures also permit removal of metal at a more rapid rate. This interesting observation, recently recorded at a plant machining cast carbon steel valve bodies, is typical. Flange facing operations had been performed, on one flange at a time, at 3½ ipm (230 rpm — 540 sfpm — 0.015" feed per revolution of the spindle) on a 9" dia. The manufacturer was concerned about a possible decrease in production through the use of a lower surface cutting speed when transferring this same work to an indexing fixture designed to handle up to 10" valve bodies. The maximum ipm available for use on the new machine would provide a speed

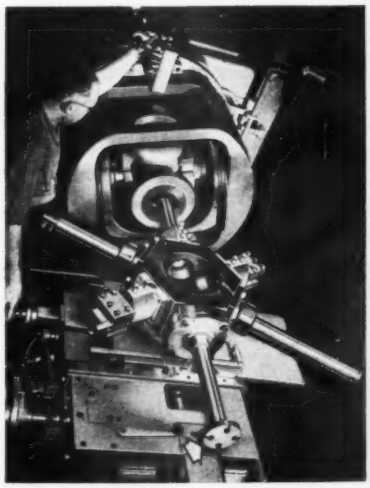


Fig. 3. This setup will accommodate ten turret mounted tools and quick change tool holders to machine 27 separate surfaces in addition to "driving in," boring, and facing the valve seat rings. Arrow points to the single, turret mounted, multiple disc driver used to "drive in" the seat rings on all the various part sizes.

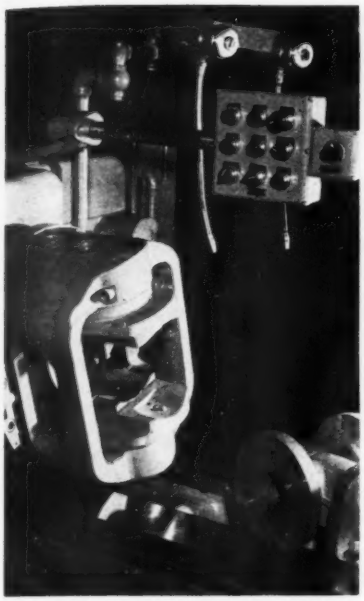


Fig. 4. Two types of remote control panels are in common use. The sliding pushbutton station is shown. Floor stand control station is shown in Figure 2.

of only 340 sfpm for the same facing operation as compared to 540 with the previous method. During experimental machining on the same valve flanges, feed rates up to 0.056" per spindle revolution were attempted with reasonable tool life and without chatter. A feed rate of 0.034" per spindle revolution was finally adopted as the most practical, representing a 43% increase in the rate of metal removal, or 5" per minute.

Apparently the inertial or flywheel effect of the heavy fixture, coupled with more rigid chucking in form jaws, closer to the cut, provided conditions more favorable to heavier feed rates than the previous chucking and clamping on opposite flanges would permit.

Tooling Arrangements and Machine Accessories

Various kinds of tooling arrangements and machine accessories also make an important contribution toward further reductions in time and manual effort required to perform the variety of machining operations necessary to completely machine a valve body in one chucking.

Here is how they are used effectively to perform all machining operations on a large pipeline body in one chucking. There are 27 separate surfaces to be machined, in addition to the "driving in," boring and facing of the seat rings. Ten turret mounted tools were provided, Figure 3, to handle all these operations. Quick-change tool holders, mounted on two faces of the cross feeding hexagon turret, enable the machine operator to change the turret tools during cutting operations, reducing machine idle-time. The gate and check valve bodies are machined using one set of tools on the hexagon turret, requiring no tool changes during the entire operation.

All three types had threaded seat rings that had to be "driven in" as a part of the machining operations. On gate and check valves the rings were finish machined prior to the "driving in" operation. The pipeline bodies required finish boring and finish facing of the rings, in place, after the "driving in" operation.

A single, turret mounted multiple disc clutch-type torque driver, Figure 3, provides the sensitive adjustment and the torque capacity required to "drive in" the seat rings on all the various part sizes. This type of driver is easily adjusted to the required torque setting and has been well-received by the industry because it eliminates, to a great extent, the shearing of ring lugs and the upsetting of the ring faces, common to the solid or "impact" type driver. The hexagon turret carriage on the heavy duty saddle type turret lathe is capable of handling many times the total torque load needed for successful ring driving operations. Use of the sensitive torque driver also serves to protect the machine tool from excessive "impact" loads sometimes associated with ring driving operations.

The forward and reverse feed stop bracket is another time-saving accessory on the heavy duty saddle type turret lathe. It enables the machine operator to set stops for distance between seats for a given lot on one size of valve body. The use of turret stops has greatly reduced the time consuming starts and stops of the machine spindle for checking to scale dimensions. Gaging for each individual part, except for excessive casting variations, can be virtually eliminated.

Frequent quick changes from forward to reverse feed during seating operations are simplified through use of a forward and reverse feed lever extension, eliminating the need for the operator to stoop over to change feeds thus permitting him to give full attention to the workpiece.

A large diameter longitudinal feed dial (0.002" or 0.015" graduations) for the hexagon turret carriage, permits more rapid, repetitive longitudinal turret settings for seating operations to gage dimensions. The cross feeding hexagon turret carriage may be provided with a turret carriage mounted precision dial indicator to speed cross settings and assure holding of close tolerances during the seat ring boring and threading operations. This will also minimize the starting and stopping of the machine spindle for engaging (starting) and driving of the seat rings.

Two types of remote control panels are now in common use. Either the sliding push button station, Figure 4, or the floor stand mounted control station, Figure 2, bring the critical control of the spindle start, stop, forward, reverse and inching, to the operator's work station. "Fingertip" controls prevent loss of attention from work, commonly present when excessive reaching is required.

Several more specialized operations on valve bodies utilize variations of the six-position indexing fixture, Figure 4. Angular seat, gate valve bodies are frequently machined in a direct-loading, five position, set-over type of indexing fixture. One manufacturer of brass

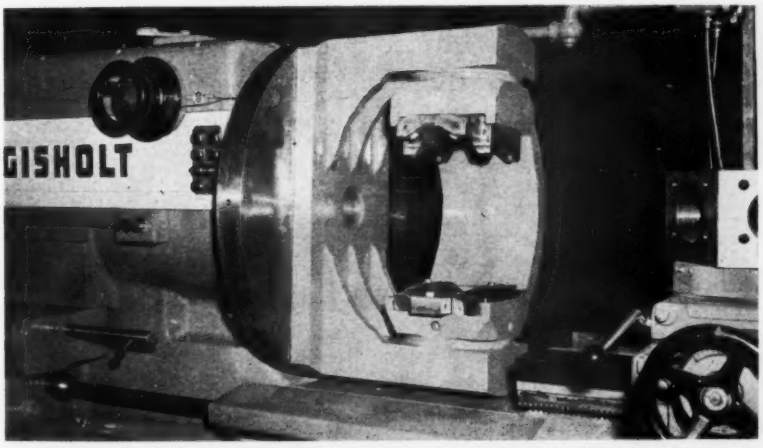


Fig. 5. A five-position fixture used in machining 3", 4", 6", and 8", cast steel gate valve bodies.

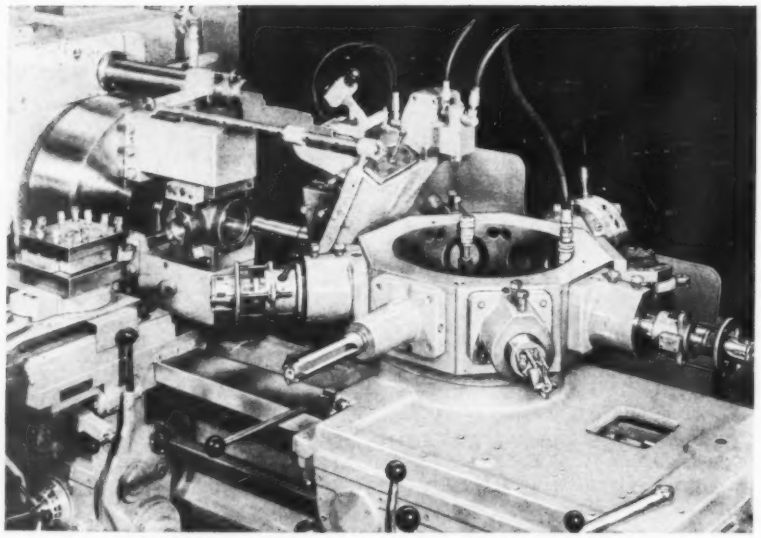


Fig. 6. A detailed view of the 3L tooling, showing the turret mounted JETracer slide tool with the overhead cam carrier bar clamped to the head stock bracket and ready for the contour boring operation.

valve bodies handles the 2", 2½", 3" and 4" gate valve bodies in a five position fixture on a heavy duty 1L saddle type turret lathe, machining the entire valve body, including the integral seats, to gage dimensions in a single chucking.

Another manufacturer uses a 5-position fixture, Figure 5, and the machine accessories previously discussed to machine 3", 4", 6" and 8" cast steel gate valve bodies on a heavy duty 3L saddle type turret lathe. A cross feeding octagon turret provides eight turret tool mounting stations.

Collapsing taps having double end chasers are employed in conjunction with the turret threading attachment for threading both seats in alternate settings of the fixture. Accurate relationship between the seats is automatic as the eccentric pin controlling both angular positions is located in the same fixture bushing to maintain identical off-set for either side of center.

A heavy duty saddle type turret lathe, Figure 6, equipped with a four-position indexing power chuck, octagon turret and a turret mounted JETracer slide tool, solves a complex four-way machining problem. The fully tooled square turret tool post and the fixed center octagon turret, offer a total of twelve tooling stations to accomplish the machining of the screwed end type steel valve body in one chucking of the part. Four threaded surfaces (three different threads) are die cut or tapped, using automatic self-opening die heads and a collapsing tap in conjunction with positive lead provided by the full length lead screw and selective gearing.

The turret mounted JETracer slide tool establishes close tolerances and holds the relationship between critical surfaces because the tracer finger follows a pre-determined contour on the overhead template. In addition, because the JETracer handles the complex diameters and radii, the original high cost and the expensive up-keep of form tools is eliminated. Operator attention to critical surfaces and tolerances is considerably reduced and inspection is greatly simplified since the initial setting of the tracer template to one surface or diameter, automatically establishes related dimensions.

Tilt Chuck

A frequent and useful variation of the multi-position indexing fixture, Figure 7, is the two-position, power operated seating chuck more commonly known as the tilt chuck. The seating or tilt chuck is particularly applicable when the bonnets and flanges can be faced simultaneously at surface cutting speeds of 500 or 750 sfpm on a three spindle facing machine. The seating chuck then provides the means to locate from the previously machined bonnet, orienting from gate guide surfaces to machine and drive the seat rings. It allows the operator to switch from one seat angle to the other through power tilt, while the machine spindle continues rotation. The base of the fixture is open so that the tools and the seat rings can be manually inserted in the valve body, greatly simplifying the operation. This type of chuck has been adapted on the heavy duty saddle type turret lathe to handle gate valve bodies up to and including the 14", 150 lb. cast steel body.

Gap Bed Turret Lathe

Versatility and flexibility in tooling and rapid changeover, coupled with ease and facility of hexagon turret operation, have made the large swing gap bed, Figure 7, saddle type turret lathe a favorite for flange facing and seating operations on gate valve bodies up to and including the 20" and 24" 150 lb. cast steel.

A 53" dia swing, gap bed machine handles up to the 20" size or a 60" dia swing gap bed machine handles parts up to the 24" body size. A single machine is readily adaptable with a face plate or a four-jaw independent chuck for flange facing or seating operations, as the need may arise.

One set of versatile turret tools, (six stations), provides tooling for sizes ranging from 24" gate valve bodies down to the 12" size and for a 6" weld-end, high pressure body. The face plate is readily equipped with angular adapters to position the work to the proper angle for the seating operations. Users of the large gap bed turret lathes find that the advantages and ease of operation of the multi-station cross feeding hexagon turret, more than offsets the minor disadvantage of horizontal loading.

Ring driving operations using the multiple disc clutch type torque driver, mounted on the cross feeding hexagon turret, save the extra work handling necessary when the rings must be driven in, in a separate operation, away from the machine.

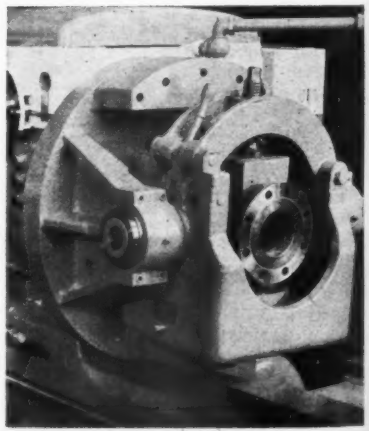


Fig. 7. The tilt chuck is a power operated, two-position variation of the multi-position indexing fixture.

Flange facing operations can be easily accomplished while holding the work in three jaw or four jaw chucks. The power chuck wrench is a frequent companion of the heavy duty chuck for speeding chucking operations and reducing the manual effort required of the operator.

Minimizing the amount of unbalance in the fixture for the central machining positions, greatly facilitates the use of optimum cutting speeds, even on the largest and heaviest parts. A finer finish on the machined surfaces is also obtained when the machine spindle, fixture, and typical workpiece, Figure 8, are balanced as a unit prior to machine assembly. Balancing of the fixture with the part in place also serves to reduce the total unbalance in the off-set position with a secondary improvement in cutting speeds. **end**

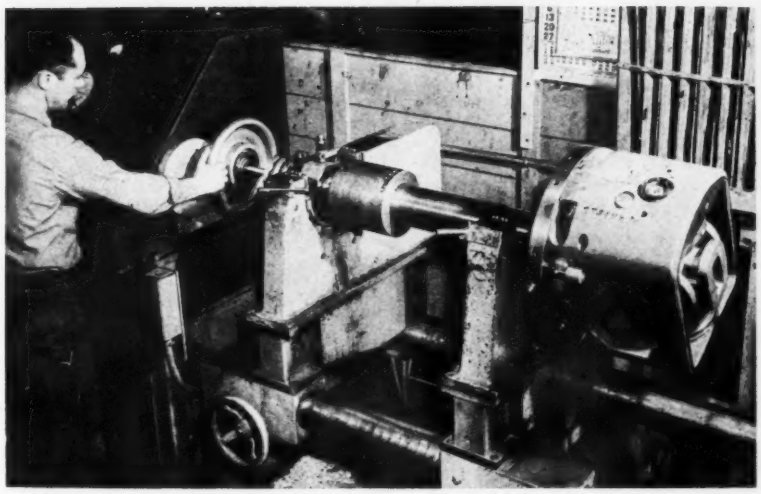


Fig. 8. Setup for balancing machine spindle, fixture, and typical workpiece as a unit prior to machine assembly.

CARBIDE SPRAY OFFERS QUICK, ECONOMICAL HARD FACE

Tooling and production hard surface requirements — and they are numerous — are met in several ways: by the application of heat treated steel, cementing or brazing-on carbide inserts, welding on hard surface materials (available in rod form), and plating, to name a few. These methods all have their place, and the sprayed carbide method is taking *its* place with the others.

Kenspray, a hard surfacing carbide powder is applied to metals quickly by conventional metal spray techniques to provide a wear surface whose qualities are akin to those using cemented carbide inserts. As sprayed, a mechanical bond exists; after fusion, it's claimed that the mechanical bond becomes metallurgical in nature. And, from the bending and sledge-hammer beating Kennametal engineers gave a coated workpiece, this could well be so.

After the spray application by a hand-held or mechanically-held gun, the part is heated by an oxy-acetylene torch, or in a furnace, to fuse the carbide deposit to the base metal.

The hard surface overlay can be applied in controlled thicknesses of 0.010 to 0.090" on any base metal whose melting point is above 2000°. Some steels, such as the 300 and 400 series stainless, require preheating.

This appears to be an extremely economical hard surfacing procedure. The cost is reported to be $.02/sq in/0.001" of thickness applied (including labor, etc.). One pound of Kenspray powder covers 32 sq in at a thickness of 0.032". This takes into consideration an approximate loss of 20% from overshooting the part while spraying. In many instances less than a 0.032" thickness is needed. It is interesting to note that the $.02 cost might even be less, depending on the overhead-burden of those employing the use of the process.

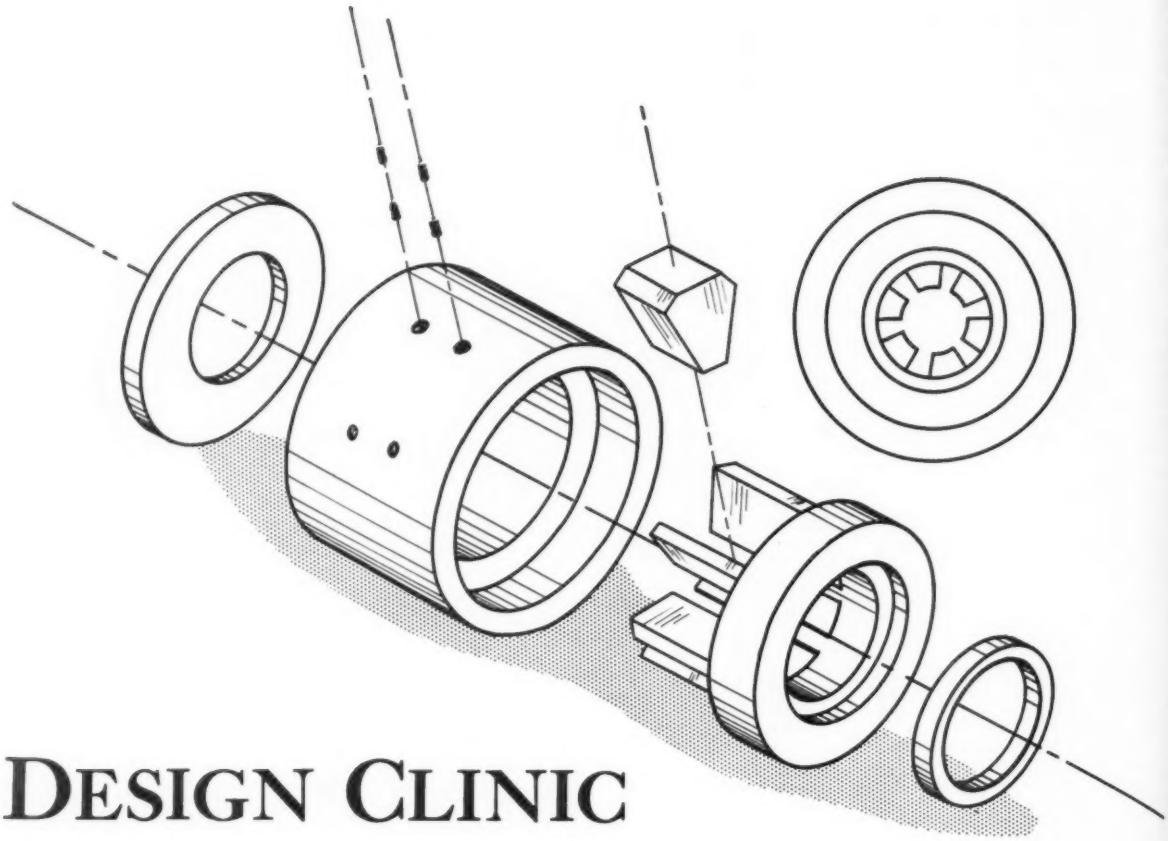
Recently, we had the pleasure of seeing a Kenspray demonstration. It went like this: The workpiece was cleaned by any method that would remove all foreign matter and roughen the surface for a mechanical bond. Cleaned, the workpiece was then sprayed. By all appearances this required no skill; in fact the operator wore street clothes and used no protective covering for his face or hands. It was pointed out, rather dramatically, that the danger of being burned by a hot gun is non-existent — immediately after shutting off the "fire" the operator took hold of the nozzle with his bare hand. A "cold" gun results from the use of low pressure compressed air as a powder feed medium.

After the spray application an oxy-acetylene torch was "played" over the carbide surface, which appeared to glaze in a very few seconds. Glazing indicated proper fusion, and the job was done.

Finishing was not demonstrated, but we were told that rough grinding is usually done with a green or black silicon carbide wheel, H to K hardness with 24-36 grit. A fine finish is best attained with a resinoid bonded diamond wheel of 100-150 grit concentration. It was suggested that grinding be done wet to avoid heat cracks on the surface. Further, they said:

- As fused, the carbide surface will be Rc 56 — ready to use.
- The base metal may be heat treated for achieving a desirable core toughness, if needed. For this they suggest the use of base metals other than the water hardening types. Here the desire is to avoid incompatible sudden size changes between overlay and workpiece.
- Optimum control can be acquired by mechanizing the part holder and gun actuation.
- Right angle spray heads can be used to traverse the ID of cylinders. And OD spraying is being done on lathe setups.
- Masking for spot control can easily be done by a number of commercially available "stop off" preparations.

—W. E. H.



DESIGN CLINIC

Conducted by . . .
William E. Hoffman
Associate Editor

WHAT'S WRONG WITH THIS . . . FOR A SPLINE GAGE?

. . . As mentioned in the June "Design Clinic," we see many good designs, many poor designs, and some that are interesting but of questionable merit. Once again we have for your appraisal, a proposition that falls in the latter category. The proposition is stated, construction discussed, and finally "what the editors think." At the end are a few of the many letters we received in response to the June Design Clinic.

THE COST APPRECIATION OF ANY GAGE IS ALWAYS RELATIVE to the expected frequency of use. It must be assumed that the spline gage pictured here would be used for 100% checking of small lot production with the expectancy of its being used on repeat orders of the same lot size. It should also be stated that production will be done in a small shop whose machinery might not be particularly well adapted for precision work, and that the shop had received the order due to price concessions. Tolerances are not too tight. This spline gage was designed to overcome the cost dis-

advantage of a one-piece gage, and to provide "regrindability" to compensate for wear. Great care and special equipment would be required to fabricate a one-piece gage.

This gage consists mainly of a bored-out body to hold a spider spacer for positioning the insert teeth. For the purpose of guiding the workpiece through the spline gage a ring is arranged on either end, their ID's being made to high limit OD of the workpiece. Set screws are spaced around the body periphery to hold the inserts in place. These in turn are locked with additional screws. The second set screw prevents tampering; further, the lock screw socket could be filled with solder. Gaging surfaces of the insert teeth are hardened and ground.

The gage is functional, its principal use being to check the spacing of the teeth, OD, ID, and tooth thickness.

1. *Do you like the approach to the problem?*
2. *Do you like the construction?*
3. *Do you think it will work well?*

. . . What the Editors Think of This Gage

If the tolerances to be held are close and the gage tolerance approximately 10 times as close (usually 10% of working tolerance) the cost of building this gage would be prohibitive. Also, this gage will be a single-purpose gage, for use on only one job; if a number of standard indicating gages were to be purchased and adapted for gaging separately the several specifications of a spline, these gages would then be available for adaptation to other gaging. This will be discussed further later on.

Here are our feelings on the construction of the gage in question: Our first thought is, that if this gage is to be used for 100% inspection, principally because the equipment within the shop is unable to hold close tolerances, it is doubtful that this same shop could turn out a piece of gaging equipment for this purpose. This would entail the first additional cost of having to farm out the building of the gage.

In cutting the spider spacer frame, great care would have to be exercised if it were to be done on a horizontal mill with face cutters or on a vertical mill with an end mill or on a slotter or shaper (deliver the poor toolmaker from these last two methods). At any rate, precision equipment would be necessary, although the situation could be helped by grinding these fingers after their having been roughed out by one of the former methods. We do not see any necessity to harden this part.

The insert gaging members could be cut off from one bar that had been milled to the approximate wedge angle. They could then be hardened and ground to the exact dimensions. It is doubtful that lapping would be necessary. Offhand we see no tangible way that these respective teeth could be lapped to their respective spider nests. A lap master would be an additional expense.

Although lapping was suggested in the original concept, lapping the teeth, each to its respective nest, may present spacing inconsistencies due to time and pressure differences. It seems more reasonable to more closely control the angularity of the mating parts during machining and allow the spider to do the spacing.

Another problem, a minor one, would be in obtaining concentricity of the minor OD of the gage with the ID of the guiding rings. Probably the best way to handle this would be to grind the ends of the insert teeth after they have been assembled — settin gup on the ID of the guide rings.

Since one of the nice features of this gage is the ease with which it can be corrected after wear, we see no method for an easy disassembling of the gage.

It appears that the end rings must be retained by a press fit. This would create a difficult disassembly problem, unless holes were made to facilitate the pressing out of these members, or, additional screws added. Since the gage is already too expensive, we hate to suggest additional machining. In reworking, it would seem necessary to make up a male-master to check the gage periodically, and to aid in its re-work. Here again, is additional expense.

Getting back to our original thought on using standard indicator gages, although at least three would be required — one for ID, one for OD, and one for spacing — we are quite positive that they could be purchased for less than the price of the construction shown. And as stated before, they would be usable through adaption to other jobs. In most instances standard gages can be set up with master gage blocks. With the use of indicator gages it would be easy to ascertain how much and where the splined workpiece was out of tolerance, and, knowing this, the production machinery could be adjusted accordingly.

Even though this method would require the use of three gages per workpiece check, definite information about the workpiece would be obtained. Of course, this whole discussion assumes that the production run is small enough so as to warrant only the expense of a functional gage. If production *were* higher, it is entirely feasible that a gage of this sort could be warranted for use at the machine and other indicator gages used for final inspection. However, we believe the trend is away from this since production machinery is now more easily controlled and is built to produce to closer tolerances. Too, we wonder if it wouldn't be possible to make an inexpensive female functional gage by sinking the internal profile with the proper shaped electrode in a spark-erosion machine. First off, it would seem that the cost of machining the electrode to a spline shape would be prohibitive. We are told that this is not true, since they now have an ingenious galvano-plastic that is inexpensively molded and then built up by electro-plating to make electrodes.

. . . we get letters too

Dear Mr. Hoffman:

"Your article in the June 1958 issue 'Design Clinic' with reference to blind-hole keyway milling makes very interesting reading, as we had the same problem given to us some 25 years ago.

"We tried to find a tool which we might purchase for this type of work, and did find one similar to the one you described. After cutting a few keyways, we found that the maintenance of this tool would be excessive even on a smaller sized keyway, (maximum width ¼") while the smallest width we had to machine was $^{11}/_{32}$" and up to ¾" wide, with hole sizes ranging from 1¾" dia to 5½" dia. Length of keyways from 2¾" to 6" deep. Necessity became the mother of invention, and we made

up an experimental model using a worm to drive the cutter on much the same principle as the type described in your article.

"Considerable difficulty was experienced with the trial model, but obstacles were overcome and we have now been cutting these keyways without any difficulty on a radial drill for over 25 years. Clearance in the bottom of the hole was provided for chips, and before each cut the bored hole was filled with a good grade of heavy cutting oil.

"Please find enclosed a drawing of the tool we use."

—Julius J. Yankee
Burg Machine Company
South Walpole, Mass.

"Blind Hole Keyway Milling Tools have been used at this company for the past 25 or 30 years. These tools are almost exactly similar to the described design, and have been manufactured and sold by the National Machine Tool Co. of Cincinnati, Ohio, in a complete range of sizes. It has been our experience that these tools perform the operation of blind keyway milling satisfactorily. The cutting action is reasonably good, and wear and maintenance is not excessive and simple to correct.

"As suggested in your editorial comment, it is preferable to design to eliminate this kind of machining operation if possible."

—A. G. Hofer
Gisholt Machine Company
Madison, Wis.

"The tool you discussed has been used by us for over 25 years. The manufacturer is National Machine Tool Company, 2270 Spring Grove Avenue, Cincinnati 14, Ohio.

"We like them very much and find them very useful in our manufacture and also in our jobbing business. The driving pins are easily and quickly replaced, and we feel that this expense is negligible and justified in getting the job done. We are using them on bronze, Ampco, steel, and cast iron. They are used on our drill presses, radial drills, boring bars and occasionally on our milling machine on special jobs."

—Arthur W. Schneidewind
Sheboygan Machine Co.
Sheboygan, Wisc.

"It is admitted that the tool design showed a great deal of ingenuity. However, good product design may allow this operation to be performed on a conventional slotter. The enclosed sketch shows two methods."

—S. W. Kille
Conneaut, Ohio

"We have been using such a device as you described off and on over a period of approximately 2½ yrs. We have been satisfied with its operation and it has not shown any excessive wear."

—C. H. McAuley
Westinghouse Electric Corp.
Staunton, Virginia

"Your design of a keyseat miller is very similar to one with which we have had experience supplied by National Machine Tool Co., Cincinnati.

"We recently completed an order of 1356 aluminum sand castings, where the cutter was used to mill a slot 0.110" plus 0.003", minus 0.000" wide, 0.012", plus or minus 0.002" deep, x 2⁹⁄₁₆" long, in a 1½" bore. The job was run on a drill press at a top rpm and with a very slow hand feed. Operation took close to 2 min.

"Although full of misgivings at the start, the tool performed admirably. Two dozen extra drive pins were ordered, as it was thought that they would not hold up, but the original ones never required replacement. Removing the small burr without affecting the finish on the ID was our only problem. A file took care of that."

—Clarence Van Houten
Stromberg-Carlson Co.
Rochester, N. Y.

"Where have you been hiding? The blind hole keyway miller described in a June issue has been made for years by the National Machine Tool Company."

—E. J. Farawell
Worthington Corp.
Harrison, N. J.

end

EDITOR'S NOTE:

We wish to thank all those who took the time to bring National's Keyseat Miller to our attention, and especially thank those who wrote of "specifics" on this machining problem giving a different approach.

LARGE-CAPACITY JIG-BORER FOR PRECISION MACHINING

Manufacturers whose operational requirements include machining or inspecting large components with extreme precision will be interested in the 4EA precision jig borer with work-size capacity larger than that of any other known jig borer. Built by Pratt & Whitney Company, Inc., it is capable of locating accurately to 0.0001" and can accommodate workpieces as high as 70". It can bore to the center of an 80" dia workpiece, and is designed for either manual or numerical control.

The machine provides a combined head and quill travel of 64", and as a result the spindle nose can be brought within 6" of the table working surface, and thinner work can be handled without using sub-tables which would introduce a potential source of inaccuracy. Despite its much higher column, the 4EA has an accurate vertical alignment over its entire 64" travel. This is made possible by a newly-designed column construction which has the counter-balances supported by an independent superstructure and not by the column itself.

The Pratt & Whitney numerical control system provides automatic positioning of the rectangular work table, and can be arranged to control the indexing of a built-in 48" rotary table as well. The numerical control system makes possible the reduction of machining time on complicated high-precision jobs, elimination of operator-error in reading dials, and insures maximum ease of operation.

The big precision jig-borer is shown boring 12 holes in an index turntable for a special rotary transfer machine being built by Hartford Special Machinery Co. Specifications required that positioning be accurate to 0.0005". The table measures 74" dia by 38" high.

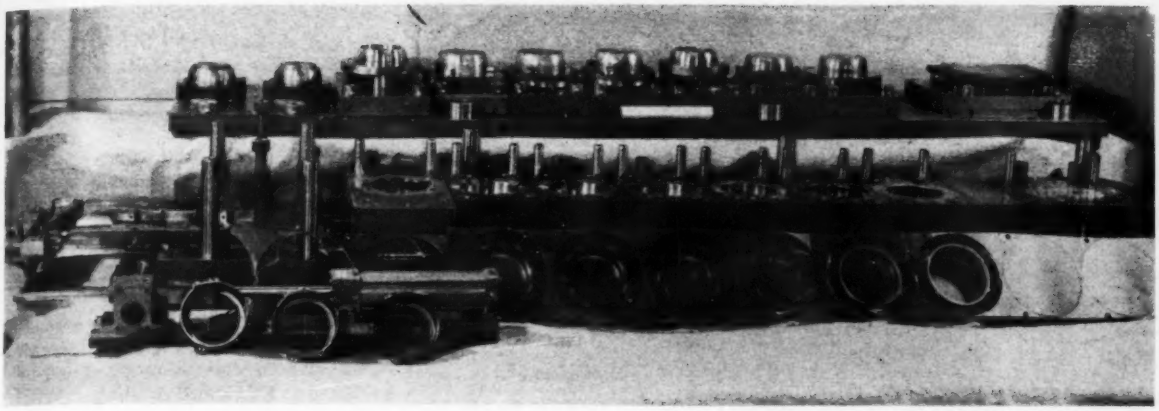


Fig. 1. Front view of die shoe and punch holder of a ribbon carrier and transfer progressive die.

CUT AND CARRY TECHNIQUES WITH TRANSFER OPERATIONS IN PROGRESSIVE DIES

by John Chismar
Designer
Wellington, Ohio

IT WASN'T LONG AGO that I was looking through a copy of TOOLING & PRODUCTION, (May 1958) when I came across a fine article on a blank and transfer progressive die for a Brandes Automatic Press. The part was an airwall register and was being produced on a very interesting combined blank and transfer method. A lot of experience and "know how" went into that die, from good sources; but a good bit of it was gained through this combination strip carrier and transfer die shown in Figure 1, that was designed and built by Sectional Die Company.

A decade ago this type of strip carrier technique combined with the transfer operations, all tied in the same die, would have been too hazardous to sustain high production requirements. It is the perfection of the transfer, after freeing the part from the strip skeleton and foolproofing the follow-up operations, that keeps this type of die in high performance. Three hundred tons striking a thousand strokes an hour, is proof for any method. My reason for having picked this headlamp ballring die as an illustration is because it has produced millions of parts and still runs service.

The operations performed in the last three stations, Nos. 9, 10, and 11 are the crux of this article. Therefore details of the operations performed in stations 1 to 8 are not discussed; only the resultant condition

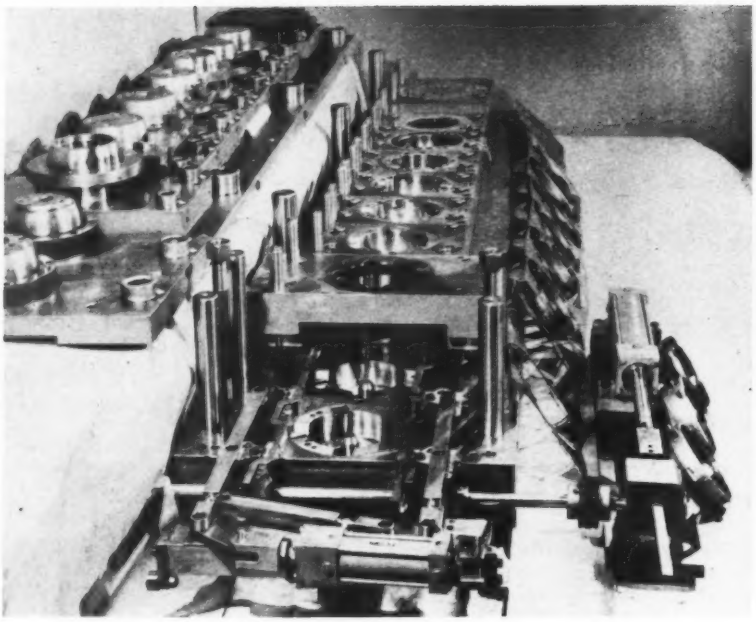


Fig. 2. End view of die shoe and punch holder, showing stations 10 and 11 where the parts are completed in the same die by the transfer technique.

of the part as it progresses up to station 9.

Referring back to Figure 1, it can be seen that the main die has been constructed on the principle of each working station being mounted on individual sub-die sets. In turn, each set is aligned on a specially designed master die set. Picking up Station 1, on the right of Figure 1, we have a standard double lance "blank for carrier" type sub-set. The operation performed in this station is piercing two pick-up pilot holes. The pilots then pick up on the trail side of the blank before lancing it and the carrier ribbons around the blank. It is these carrier legs that transport the part through all operations until it is cut free, in order to finish the part by the transfer technique. The blank is carried at four points, which had to be so positioned as to gain the best advantage in cam piercing five tabs and notching three slots in the part.

Station 2 was designed as an idler to provide the necessary room for construction of the two flanking stations. In Station 3, the first draw is made. In Station 4, the blank is trimmed and the cup brought to size for the final draw. In Station 5, the function is to redraw the part to its full depth. This was determined along with the amount of trim in Station 4, by the diemaker. Also in this station the bottom is blanked out to size.

Two tabs are cam pierced out in Station 6; along with the same action three lug slots or notches are being put in the cup. Following up in Station 7 is more cam piercing for three mounting ears. In Station 8 the work of piercing and extruding all necessary holes and notches is performed to complete the part.

This is where the part now leaves the strip skeleton, which has given it transportation from station to station. The minute details of the above stations and their actions would furnish sufficient material for a descriptive article in itself, however, it is the work being completed in the last three stations that make this die fascinating to watch in operation. The pinch trim of the four carrier tabs and the driving through of the part to be picked up by the transfer fingers in Station 9 and indexed to Station 10 is where we'll go into more detail.

There are many classic motions taking place in these last three stations. The description given is the action that takes place in each individual station on the ram down stroke; with the side and advance movement of the transfer arms tying them together. The cross section drawing, Figure 4, showing the press, die, and lifter plate, gives a picture of what is almost a "press within a press" required to finish the last two operations on the part.

In Station 9 the punch holder subdie set is still mounted and aligned to the master die set punch holder, but the lower die shoe is now mounted on the transfer die shoe. On the down stroke of the press ram after the lifter stools have lowered, the pilot locating nose of the sub-die punch holder locates the part and travels down until the stripper and pinch trim punch complete their work.

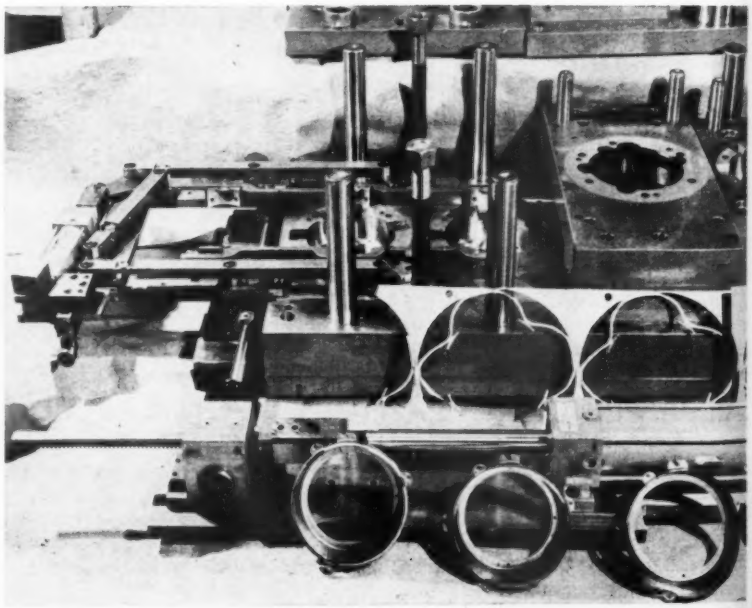


Fig. 3. Close-up view of transfer mechanism; showing rack and gear indexing assembly, which is mounted on the press bed.

This would have completed the work in most other progressive dies, but in the die shoe of Station 9 there is a 4" stroke air cylinder, with a pick-up nose, that rough locates in the blanked out bottom hole of the part. Kicker pins from the pilot nose help strip the cup from the pilot and seat it on a floating bronze locating pad that is embedded with a series of permanent magnets. These magnets do the job of keeping the part in alignment for the pick up and transfer to Station 10. The air cylinder returns with the ballring to wait for the bulldog jaws of the transfer arms to carry it for the start of the lip camming operations.

Stations 10 and 11 have technically the same motion, with working details designed to complete their individual assignments. The sub-set punch holder has two working stations mounted to it and is an intermediate between the lower die shoe and a driver plate; which is mounted to the top platen of the press. The reason for practically floating this punch holder in midair is to have a place for the scrap strip skeleton to pass over the top and on into the back roll feed. Figures 4 and 5, graphic cross sections, have been simplified to illustrate the tie-in between the press and die.

The punch holder is retained in the up position by an air cushion mounted on the top platen. Four rods, in this case, come through the platen and are fastened to the punch holder. The two adjustment rods, coming from the lower die shoe, are used as stops. By this method, the floating punch holder is retarded on the down stroke until the drivers come in contact with it. They overcome the air pressure on the punch holder and move the expanding cam noses into the part. These are opened by a lower cam expander and the form punch moves down to form either a 45° or the full 90° lip on the part as it is seated in its nest.

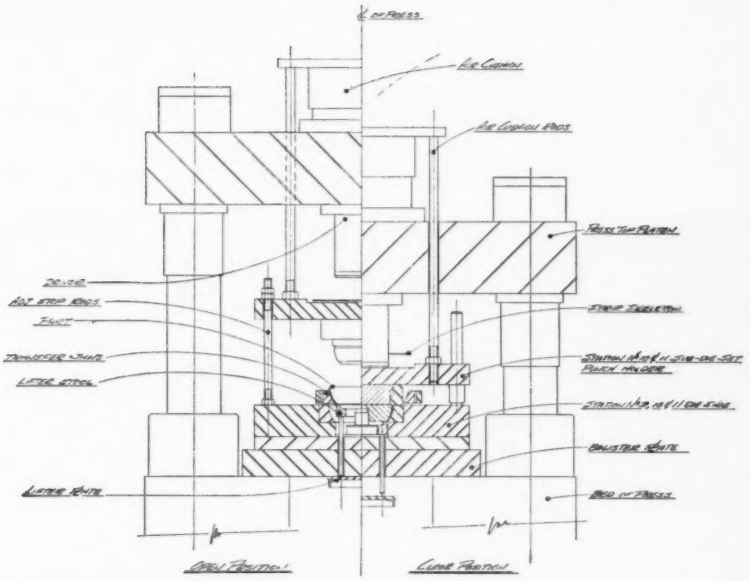


Fig. 4. Cross section of press, die set, and air cushion assembly in Stations 10 and 11. This layout shows the floating type punch holder used.

With the lifter stools, part and cam noses move out on the up stroke and the punch holder moves back up to the stop rods. The strip skeleton, from the original metal line, is pitched and the transfer mechanism moves into place to index the part and drop the finished part off the end of the press.

There are several methods of getting the index motion on a transfer setup; but the one shown in Figure 3, is a rack and gear movement mounted on the press bed. An air cylinder in this case, provides the motion required to index the transfer unit. A drive shaft from this rack and gear assembly puts into motion gears in two small gear boxes. Powering for the index assembly comes from the racks built in the gibbed dovetail assemblies that have been inserted down each side of the transfer die shoe. These carry the transfer cam plates, arms, and pick-up jaws.

The drawing in Figure 6 is a layout showing the index air cylinder mounted in the center of the master die shoe. This method is much simpler if you have the room to get the correct mounting, the correlation of which has to be made in your own design.

The sub-assembly of the advance and retard cam plates, arms and air cylinder are mounted to an outboard

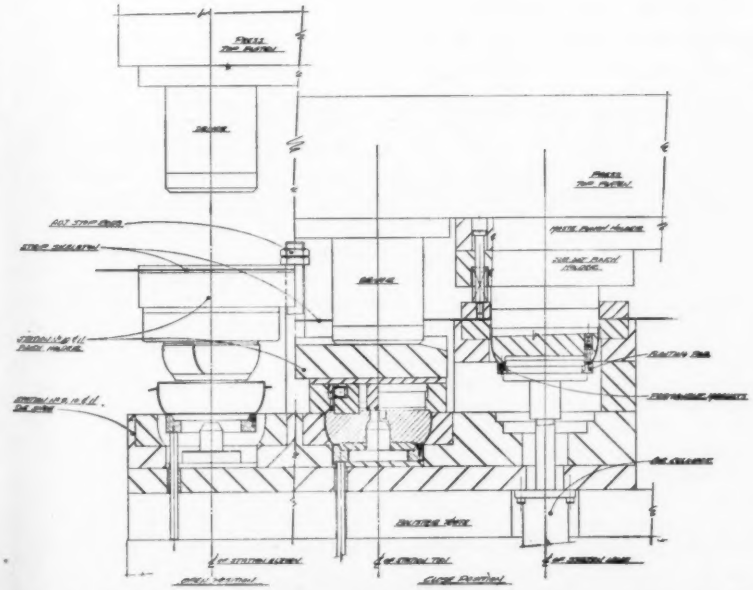


Fig. 5. Graphic cross section of Station 9, showing its pinch trim action, and Station 10 camming a 45° lip on the part. Station 11 is in the open position, with the strip skeleton passing over the top of the intermediate punch holder.

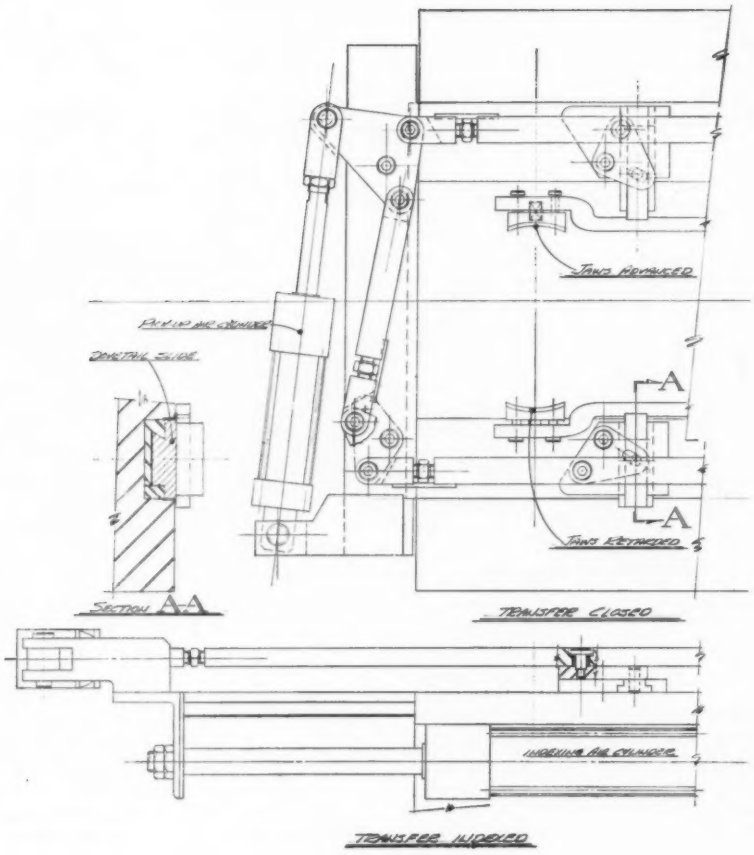


Fig. 6. Transfer mechanism layout, for picking up part and indexing it to additional stations for further operations.

support, which ties these two dovetail slides together. The air cylinder on this outboard support, advances, setting up a line motion to both sides of the mechanism. This moves the jaws in for the pick-up. The index motion then advances to pitch and you have a reversal of the above motion; this either sets the part up for a new operation or drops it off the end of the press completed. The transfer assembly then returns back to its pick-up position with jaws opened, awaiting for the rotary band switch to cycle its operation again.

In Figure 2, you can pick out the cam roller supports used on this short transfer unit; it is not needed if you have the length on your dovetail slides to hold the weight of the outboard support bracket assembly. This lower die unit is set up with safety microswitches in each station to guard against mishits, misalignment of the part or mistiming of the transfer pick-ups themselves.

It might be now or in the future that you'll have to come up with a decision to use a carrier type progressive or transfer die; it might be easier to use them both in the same die. end

FOIL WELDING MACHINES NOW MANUFACTURED IN U.S.

The Peco Foil Butt Seam Welding Process has been introduced into the United States from Europe where it has been used in production for several years with reportedly outstanding success.

The process involves introducing a thin strip of foil on each side of the butt seam to be welded. Foil acts as a bridge to distribute welding current to both sheets, and also prevents too-rapid withdrawal of heat from the joint area. Foil strip offers added electrical resistance and helps contain the molten weld nugget while it grows in area and cools. Sheets are generally clamped, and in some instances the foil is spot tack welded at lower heat before being seam welded.

Precision Welder & Flexopress Corporation is now manufacturing machines using the Peco Process, as

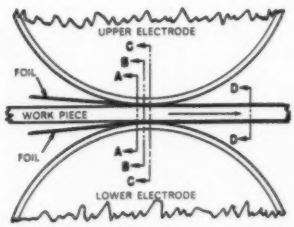


Fig. 1

exclusive licensee in U. S. and Canada. The new Precision machines make smooth, non-overlapping seam welds of dense structure and high strength — at higher speeds than ever before. Welds have been made on 0.078" stock at 3 to 24 sfpm. Because the Peco process requires less heat and pressure than mash welding, there is less power demand and less warping of sheets. It can be used for mild steel, low alloy, high carbon and stainless steel.

Figure 1 illustrates the progress in making a foil butt weld. As the workpiece, with foil on both sides, passes between the electrodes, a small molten weld nugget forms at A-A. As the welding continues through B-B and C-C, the weld nugget becomes larger until at D-D the completed weld takes the shape as shown in Figure 2, which is a Photomacrograph of 0.078" mild steel, foil butt seam welded at 144 ipm.

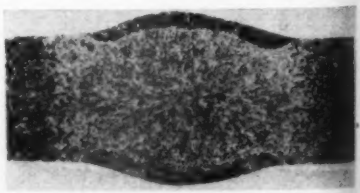


Fig. 2

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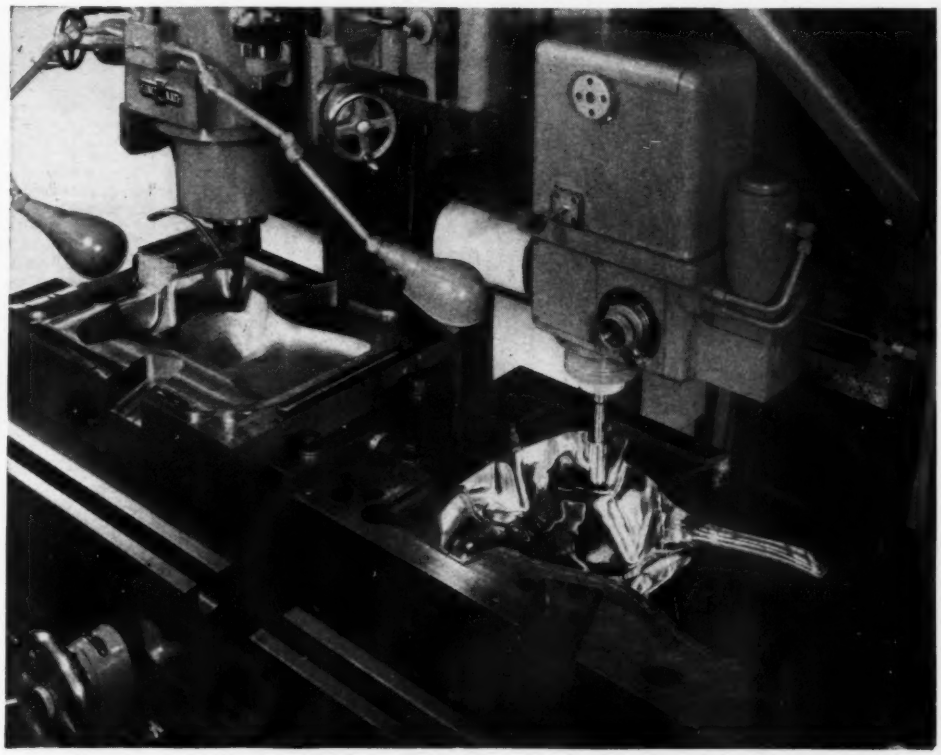
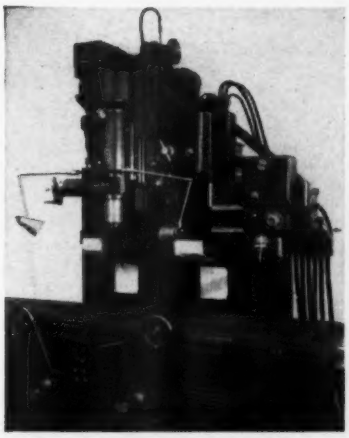
on CINCINNATI 28″ Vertical Hydro-Tel



Life-size dress form mold, milled complete in one setting, on a CINCINNATI 28″ Vertical Hydro-Tel Milling Machine.

Starting with a solid block of die steel, the life-size dress form mold in the above illustration is machined complete in only 42 hours! This includes the parting face, gates and mold cavity. And the entire job is accomplished in one setting. Hard to believe? It's one of the actual jobs milled on a CINCINNATI 28″ Vertical Hydro-Tel Milling Machine, equipped for combination automatic depth and 360 degree tracing. ¶ These machines reduce die and mold costs in two ways. 1) They are ruggedly constructed to remove metal rapidly. For example, the Hydro-Tel for the above job (96″ table travel) weighs about 15 tons, and is equipped with a 10 hp spindle drive motor. 2) They take extra smooth cuts in the mold cavities, thereby reducing hand finishing costs to a minimum. The tracing finger automatically scans shallow and deep cavities alike, with the smoothness inherent only in Cincinnati's hydraulic tracing. ¶ Many tool and die shops are machining molds and hobs of all sizes and shapes on CINCINNATI Hydro-Tel Milling Machines. And because of Cincinnati equipment, their costs are lower. ¶ See what Cincinnati has for your tool and die work. The complete line is illustrated and described in general catalog No. M-1961-1. Get a copy today.



CINCINNATI 28″ Vertical Hydro-Tel Milling Machine. Catalog No. M-1773-2. Brief specs in Sweet's Machine Tool File.

Machine Tool Division

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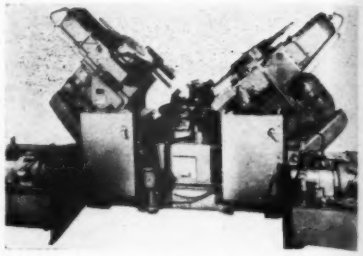

Fig. 1. The fixture shown on this machine is built on the table of a standard 4-position power index table. Only two positions are utilized, which permits the operator to load one forged aluminum cylinder head while work is in progress in the second station. The part is then automatically indexed, which eliminates loss of machine time for loading and unloading.

The machine shown in Figure 1 utilizes a 4-position power index table, making possible the loading and unloading while the aluminum cylinder heads are being machined.

The machine shown in Figure 2 utilizes both a 6-spindle and an 8-spindle turret that are mounted in a horizontal plane for carrying out a sequence of machining operations on opposite ends of valve bodies. The special holding fixtures are designed to locate and hold a single valve body at one time. By changing fixtures and tools and resetting the speeds, feeds, and depth controls, the machine can be set up for machining other sizes of valve bodies or other work.

Fig. 2. This machine is equipped with a 6-spindle and an 8-spindle turret arranged horizontally for machining opposite ends of valve bodies.

Although possessing all of the advantages of special machine tools, these machines can be readily changed over from one part to another to provide maximum flexibility. One such machine can be used for a series of different parts, and model changes in no way obsolete the equipment.

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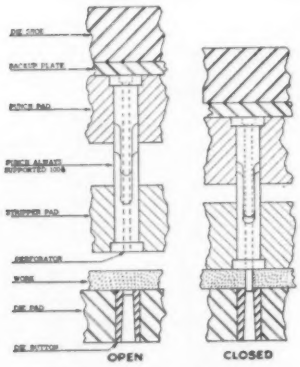

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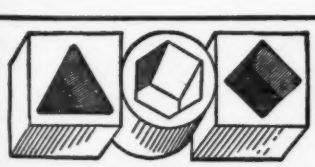

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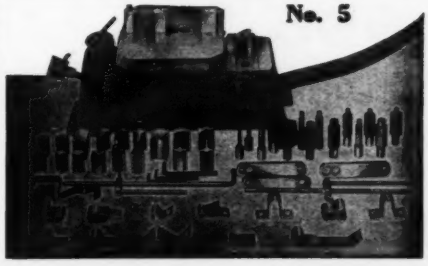

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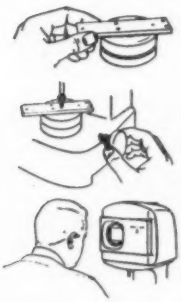

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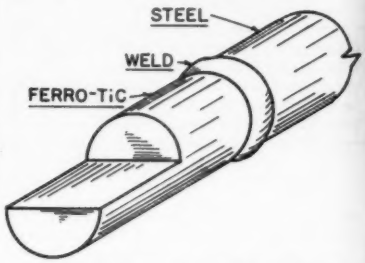

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DEATHS

John J. Delaney, 62, General Manager of the Reliance Regulator Division of American Meter Company, died June 10 after a brief illness.

John D. Joyce, Sales Engineer for Loftus Engineering Corporation, Pittsburgh, was fatally injured in an automobile accident near Houston, Tex., June 18.

Henry G. Riter III, 65, honorary Chairman of the Board of Copperweld Steel Company, died in Montclair, N. J., June 30, after a short illness.

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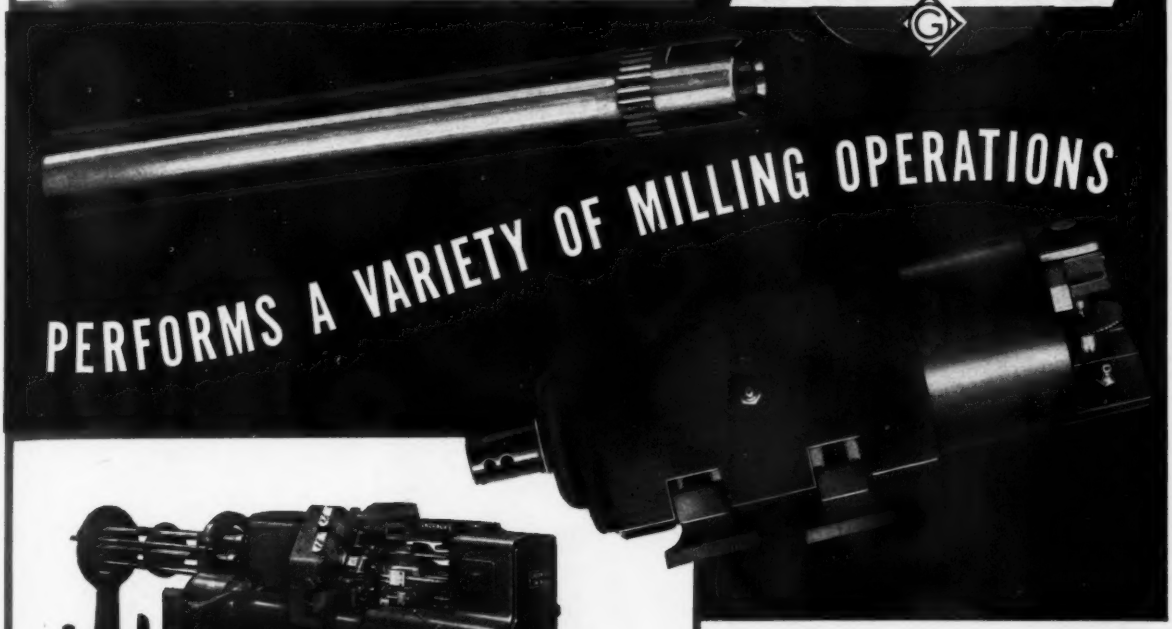

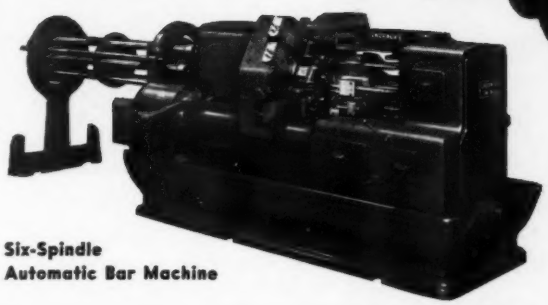

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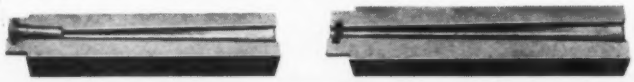

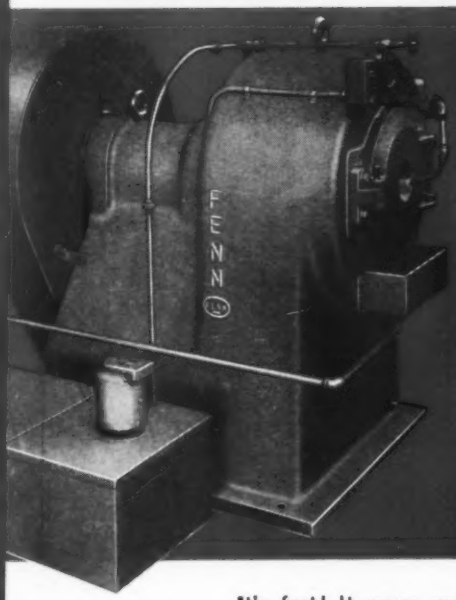

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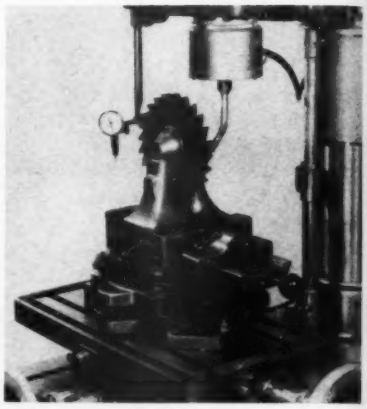
FENN MANUFACTURING COMPANY • 204 Fenn Road • Newington, Connecticut
CIRCLE INFORM-A-GRAM KEY NO. 76

SPARK-DEPOSITION A REVERSAL OF SPARK-EROSION

Spark-deposition of tungsten carbide on the surface of cutting tool materials, thus improving tool quality and life, has been made possible by the introduction of the Sparcard machine by Impregnated Diamond Products Ltd., England, handled in the U. S. by Easco Products.

The Sparcard machine is a spark unit that transfers metal from the electrode to the work surface. The main differences between this new



A milling cutter setup on the Sparcard machine for treatment from a tungsten carbide electrode.

machine and that for spark erosion lie in the circuitry and the replacement of the servo feed with a vibrator. The vibrator, situated below the machine head, has a clamp for electrodes which are usually tungsten carbide. A tool holder holds single-point tools, reamers, and milling cutters up to 8" dia.

When the tool has been set in the holder the electrode is brought almost into contact with it and the vibrator and current switched on. A spark discharge occurs across a small air gap between the electrode and work, and is regulated with the aid of ammeter and voltmeter in the work head. The spark discharged is derived from a d-c source and is condenser-controlled. In the course of the treatment, the electrode is traversed across the surface to be treated.

The actual treatment comprises deposition of a fine surface of the electrode material on the tool surface. Normally, the treatment is applied to that surface of the tool subject to the greatest wear, usually the top rake.

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CIRCLE INFORM-A-GRAM KEY NO. 771

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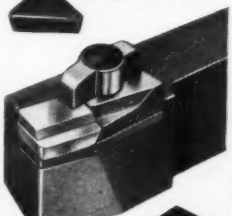

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CIRCLE INFORM-A-GRAM KEY NO. 772

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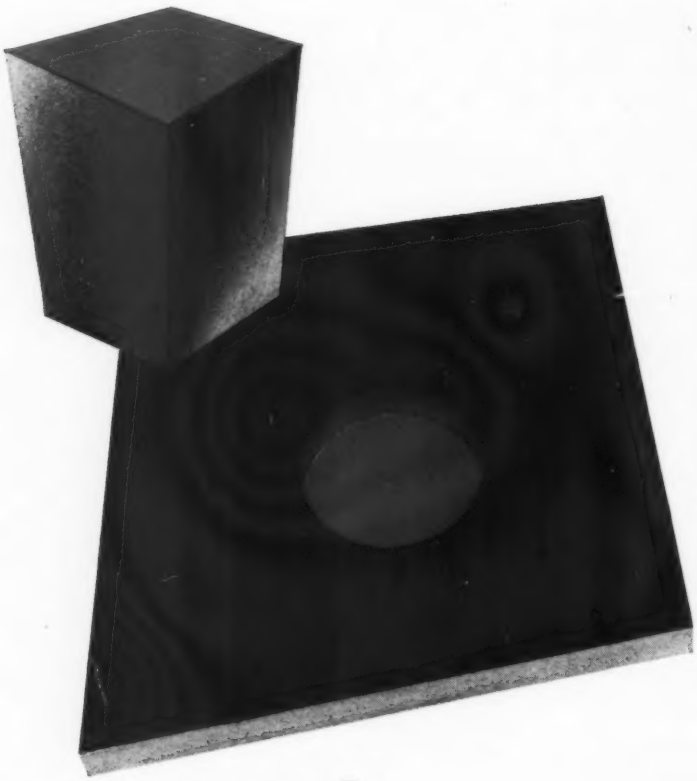
VULCAN tools

CIRCLE INFORM-A-GRAM KEY NO. 773



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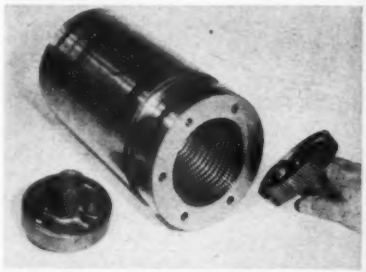
CIRCLE INFORM-A-GRAM KEY NO. 78

NEW TYPE BROACH CUTS 4" EXTERNAL HELICAL GEAR IN 5 SEC.

A new Red Ring broaching process has been developed that produces external helical gears in a fraction of the time required by conventional generating or shaping methods. In its initial application, the new process has produced an 87-tooth, 24-pitch, 22° helix angle, 4" OD cast iron external helical gear having a ¾" face width, in a 5 sec cutting cycle. A 15-sec floor-to-floor time, including loading and unloading, was achieved. Up to five minutes would be required to produce the gear by previously-used generating or shaping methods.



The key to the success of this unusual application of the broaching process, developed by National Broach & Machine Co., is the use of a solid high-speed steel hollow broach in which the broach teeth are ground from the solid in an ultra-precision broach grinding operation.

In applying the process, the gear blank has to be rotated to produce the helical gear teeth while the broach is passed down over it. This means that the downward travel of the broach has to be accurately correlated with the rotation of the gear blank. The head supporting the broaching tool is geared up with the gear work fixture through a unique guide bar, cross head, and helical lead bar arrangement. Thus, when the broach advances down over the work, the work is turned by the lead bar which has two precision helical flutes that engage internal tooth members in a fixed guide bushing in the cross head member.

Precision ball bearings in the work fixture post provide the required accuracy of rotation of the part. After the broach has passed over the work gear, it raises to initial position, carrying the gear with it. At the top of the stroke, an air cylinder ejects the finish-broached part to a position at the front of the broach head where it is placed in an ejection chute. This automatic unloading feature adds to the speed of the new broaching process.

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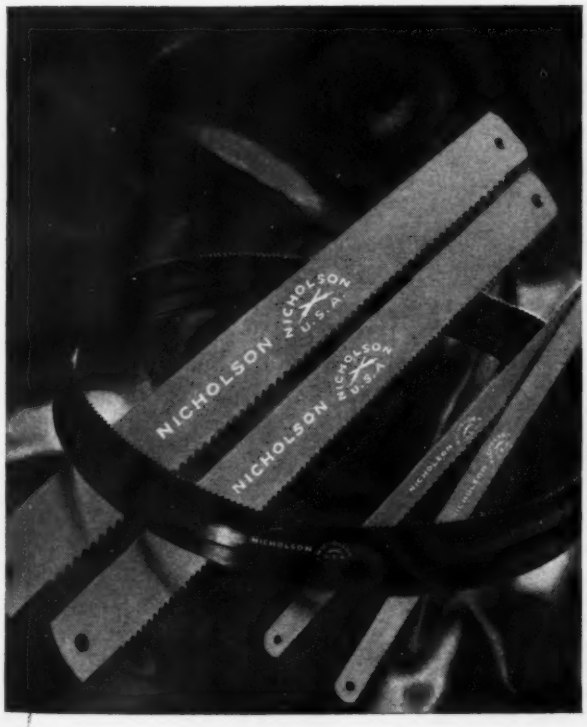

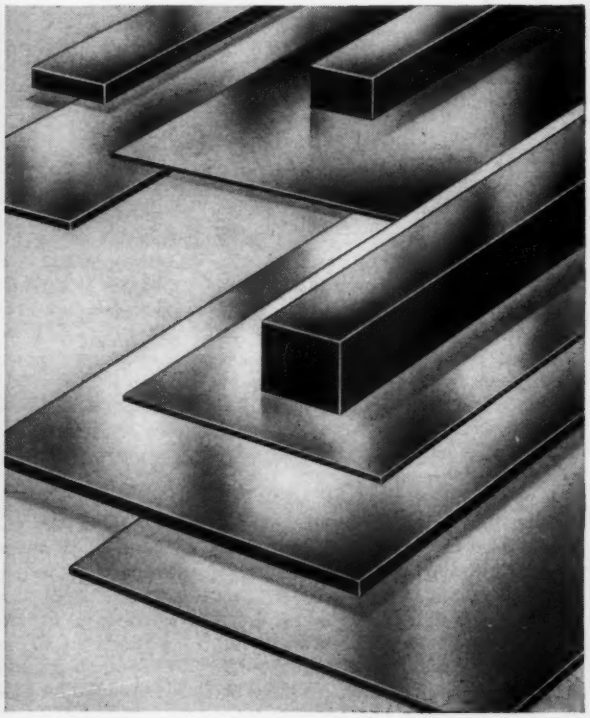

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CIRCLE INFORM-A-GRAM KEY NO. 79

Fig. 1. This 500-ton hydraulic press setup produces 7-gauge clutch plates from circular blanks. Such heavy stock requires nearly full press capacity but only a short stroke.

How Modine Uses Hydraulic Presses for Deep Drawing

by Walter W. Sheridan
Chief Manufacturing Engineer
MODINE MANUFACTURING COMPANY
Racine, Wisconsin

MODINE MANUFACTURING COMPANY makes and uses many stamped and drawn parts in the heating, ventilating, and cooling equipment it manufactures. The company also produces a number of stamped and drawn components for other manufacturers. For producing drawn parts, the company has been using hydraulic presses because they draw easily at a selected and controlled speed and pressure.

Any maximum pressure up to full press capacity can be set and cannot be exceeded with the hydraulic presses. Setup is made easily and quickly, as the stroke ends at any point suited to the die being used, without shock so chances of breaking dies are minimized. Stroke can be varied to suit the job and generally is much less than the maximum available in the press.

At the Racine plant the heaviest stamping being produced is a steel clutch plate drawn for another manufacturer from 7 gauge steel. It requires nearly the full capacity of a 500-ton H-P-M press and production averages about 230 pcs/hr. Although the drawing is not so deep as some others, the heavy gauge stock requires more pressure than many larger and deeper drawn parts. Figure 1 shows a clutch plate being removed from the press. Stock is blanked to circular form and pierced with a central hole before drawing.

Most of the other stampings produced in the hydraulic presses at the Racine plant are in lighter gauges, ranging from 22 to 15. Low carbon steel is most commonly used, but, where high corrosion resistance is required, 22-gauge M238 stainless steel is used, as for example, in half-tubes for the Modine gas-fired unit heaters. Vertical tubes in these heaters conduct corrosive combustion products through their formed passages and

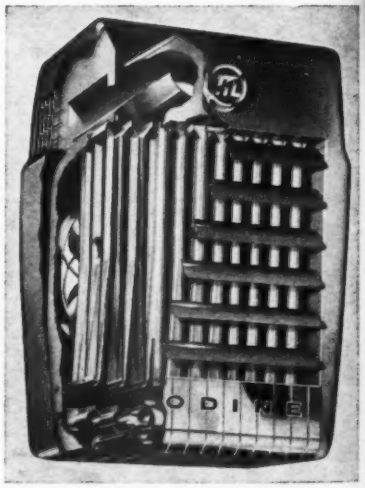

Fig. 2. Gas-fired Modine unit heaters are made mostly from stampings. The corrugated tubes inside require stainless or alumilized steel.

. . . *Continued on Page 84*

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but I convinced them that now was a good time to buy!"

When machine tool builders work with smaller backlogs they're naturally more efficient and can make better deliveries... are more able to control costs ...more able to render the many *extra* custom engineering services that disrupt regular production during peak schedules. As a matter of fact, many progressive buyers are at their busiest now... taking advantage of the sound buying position the economy gives them as it pauses for its breath... seizing the opportunity to get ready for tomorrow today.

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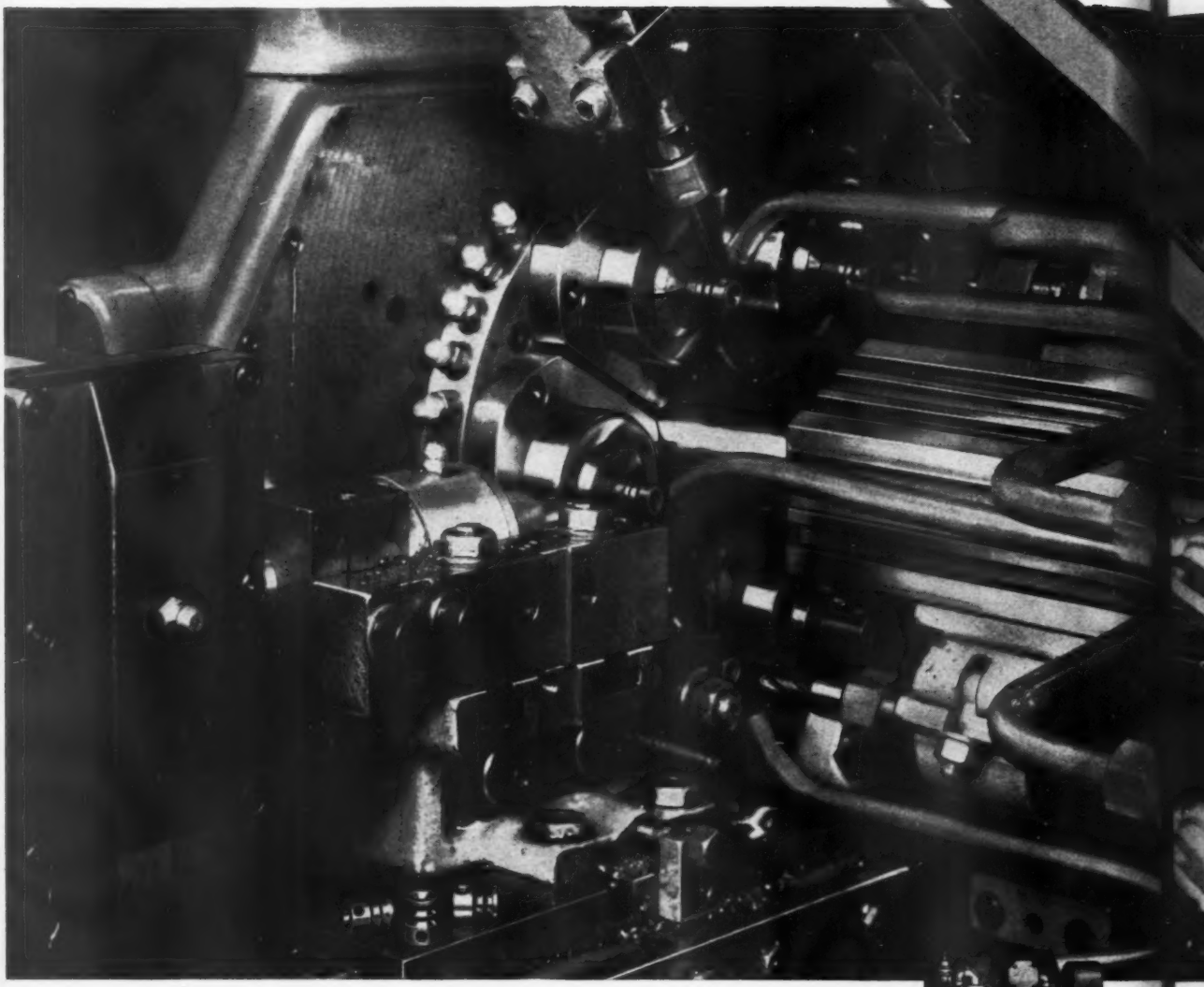

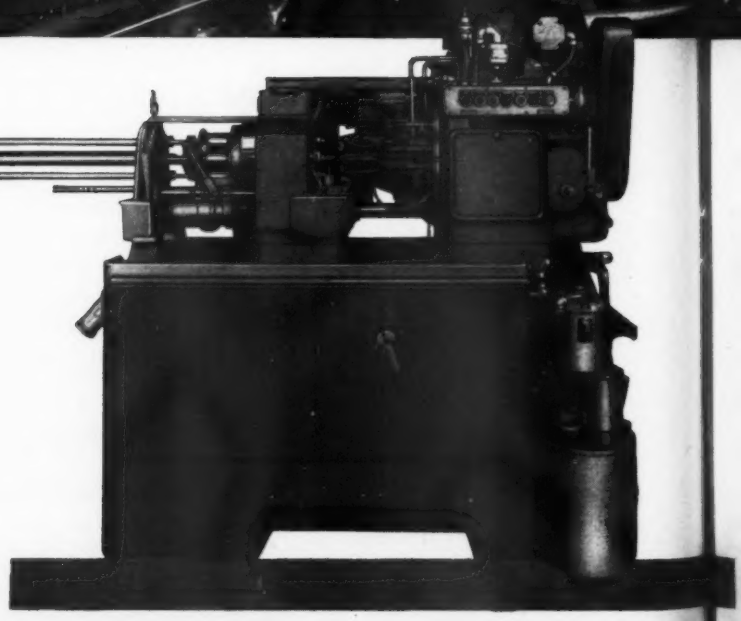

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Remember...when you buy an Acme-Gridley 7/16" Multiple Spindle Bar Automatic, you're getting the newest, smallest, fastest machine from the world's *only* complete line of multiple and single spindle bar and chucking automatics. We've been making and improving them for 60 years . . . we think we know how!

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CIRCLE INFORM-A-GRAM KEY NO. 83

. . . Continued from Page 80

Fig. 3. Half of a tube that carries gas combustion products for a unit heater is removed from a hydraulic press.

must have corrosion-resistant properties. Those not made from stainless steel are of alumilized steel.

Each tube of this type is formed in two halves in a 400-ton hydraulic press setup. After forming each half (which includes four corrugations and two ball-like indentations, as well as flanging), edges of the halves are seam welded. Spotweldings are made where the indentations meet. The tube stampings are produced in several sizes, up to 16" x 25", at a rate of about 181/hr.

Modine vertical delivery heaters contain rings of finned tube arranged in cylindrical assemblies through which air is drawn radially between fins by a horizontal fan at the bottom. Air is delivered downward through a cone jet stamping. These and other circular flanged stampings up to 42" dia are drawn in the hydraulic presses. Some cones in which fans fit are made from 18-gauge steel and have draws up to 7" deep.

The so-called "power throw" horizontal delivery heaters require deeply drawn square housing components. One, 28" square with a 6" draw, is produced at a rate of about 190/hr. Subsequently, a venturi ring is drawn at the center of one half. After shifting to another die, flanges at the center opening of the other half are formed. Each half has two circumferential bends for decorative purposes. Because these decorative bends are in side walls, they cannot be produced in the draw, but are produced in separate press operations by striking the workpiece from four directions in successive strokes.

Production at Modine's LaPorte, Ind., plant is largely automotive — truck, tractor, and similar radiators. Most of these require deeply drawn top and bottom tanks, which are produced in 150- and 250-ton hydraulic presses. In producing a Case radiator top tank from 20-gauge brass, for example, a 4⅝" draw is required and the finished piece measures 6" x 19½". Drawing is done at the rate of about 250 pcs/hr. Besides drawing, the dies produce embossed ribs that add greatly to wall stiffness. Many other similar tanks, including one of 11-gauge brass with a 6" draw, are produced in the same press.

The soft brass used for such parts lends itself well to deep drawing, but a soap solution is used to facilitate the drawing. This is applied by a roller coater to every third blank, as this practice leaves enough solution on the dies to lubricate the intervening two draws. end

GUNDRILLING ENDS PRODUCTION PROBLEM

Special shafts, designed by Snow-Nabstedt Gear Corporation for a line of hydraulically-actuated marine gears, are required to deliver a flow of oil to actuate either of two clutches and to withstand operating pressures of from 50 to 200 psi while operating a pump.

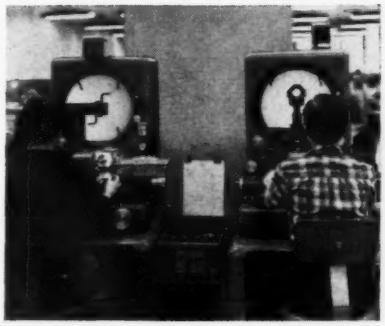
In order to transmit power from the engine flywheel at one end to a pump at the opposite end, it had to be over 3' in length. In order to rotate independently of, yet within a hollow main drive shaft, the shaft had to be under 2" in diameter. It had to have two ½" parallel holes of almost the full length of the shaft in order to deliver oil under pressure from the pump and control valve to either of two hydraulic clutches at the opposite end of the gear. It was immediately apparent that Snow-Nabstedt's conventional drilling methods would not do.

The company cuts its B1/13 cold rolled steel shafts to 36½" length and 1¾" dia. Having no gundrilling facilities at hand, they had the shafts deep hole drilled by Hamden Deep Hole Drilling Co. It was a comparatively simple operation for them to drill two ½" holes, 35½" deep, 1 1/16" apart. Parallelism of the holes to each other and to the axis of the shaft was within 0.020". Hole size was a constant 0.500" and finish well within the required specification of 125 rms.

Accurate clamping to the fixture assured alignment. Locating in the fixture was done by using scratch lines through the centers of the workpiece and the holes. These acted as both an index and a locator for clamping prior to drilling. Drills used were 50" long 0.500" dia gundrills, made by Eldorado Tool and Manufacturing Corp. Coolant was White and Bagley No. 2159 oil at 9 gal/min.

Savings in both time and cost were substantial, even after deducting shipping, handling, and costs of turning the job over to a contract shop.

See how optical gaging solves 4 basic inspection problems faster... at less cost



(1) RECEIVING: With optical gaging you get *immediate* checks on tolerance for incoming precision parts. One glance tells whether parts are to your specification. For example:

Inspectors at the *Allen-Bradley Company*, makers of electrical equipment, use Kodak Contour Projectors for fast, accurate inspection of incoming precision parts. They check *more than 400 different items*, most with multiple dimensions, and sample size of 35 or more pieces. Tolerances are held to .001". Since optical gaging permits checking several dimensions at once, Allen-Bradley has drastically cut inspection time. Parts are quickly cleared for production; quality control is better.

(2) ASSEMBLY: Mass producing your product may require fast yet accurate inspection of precision component assemblies. Here's how one manufacturer solved the problem:

Magnetron Beam Switching Tube, produced by *Electronic Tube Division, Burroughs Corporation*, has 21 elements which fit into mica holding-wafers at top and bottom. The elements must be lined up to within .002" of specifications. The problem was to do this complex inspection job *fast enough to keep up with assembly speed* in mass production. With a Kodak Contour Projector the inspector can easily match top assembly speeds while maintaining the required specifications.

(3) FINAL INSPECTION: You can inspect a great variety of finished parts quickly with the Kodak Contour Projector—and cut costs, too.

In one instance, a great variety of component parts for various manufacturers posed a serious inspection problem for *Auburn Plastics, Inc.*, a custom molder. The firm formerly used mechanical gages in large numbers to make necessary quality control checks. A Kodak Contour Projector eliminated the expense of buying mechanical gages (savings amounted to $5,000 in one instance). Now operators can inspect at a glance finished components—gage angles, radii, holes, and other dimensions—with an accuracy that meets close tolerances.

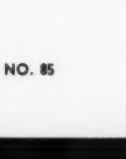
(4) PRODUCTION: Optical gaging gives you accurate, fast inspection of tools and dies during use in production.

For example, at *Stromberg-Carlson*, a Division of General Dynamics Corp., die life presented a complex gaging problem. Checking by conventional gaging methods was cumbersome, time-consuming, and inaccurate. Optical gaging of piece parts with a Kodak Contour Projector now provides a quick, accurate check of die wear during production. A typical example concerns a die which stamps out relay lever arms. The 35 dimensions of the lever arm are optically checked in 1/3 the time of other gaging methods.

Optical gaging with the Kodak Contour Projector saves time because you can check many dimensions at a glance. Saves you money, too, because one projector does a wide variety of gaging jobs. Changing from one type of part to another is a simple matter of changing your chart-gages on the screen and your fixtures.

Whatever your inspection or measuring problem may be, there's a Kodak Contour Projector to do the job—from the compact bench-type Model 8 to the big Model 30 with its 30-inch screen and large part capacity.

For additional details, send for the new illustrated booklet "Kodak Contour Projectors." Write to:



Apparatus and Optical Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak

CIRCLE INFORM-A-GRAM KEY NO. 85

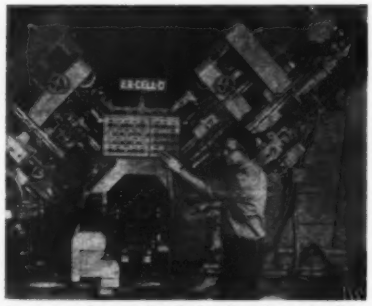
TRANSFER CONVEYOR SOLVES MATERIAL HANDLING PROBLEM

A knotty material handling problem was solved by Westinghouse TV-Radio Division engineers by use of the elevator transfer conveyor shown in the illustration. With it the cost of moving material from the shear to the press brake was reduced by 75%.

The problem was to move sheet steel from the shear at the left to the press brake at the right. The solution was a transfer conveyor of channel-mounted wheel rollers that is elevated by an air cylinder from its "down" position between the cylindrical rolls to its "up" position as shown in the photo. This cycle is paced by a shear operator: 1) the first sheared sheet is conveyed by gravity over the cylindrical rolls to a position above the transfer conveyor; 2) when the sheet hits the stop bars, a micro-switch is tripped; 3) the air cylinder elevates the transfer conveyor to the "up" position; 4) gravity moves the sheet into position for the press brake operator; 5) a mechanical stop holds the second sheet (as shown in photo) until the transfer conveyor is returned to "down" position; 6) an electrical interlock holds the transfer conveyor in the "down" position until press brake operator uses the first sheet.

CYLINDER-BORING TRANSFER MACHINE FOR V-4 ENGINES

An interesting pallet-type transfer machine has been developed for rough and finish boring V-4 engine blocks for outboard marine motors. Two engine blocks are partially machined at each cycle. At the roughing station, the rearward pair of cylinders of the first engine block and the forward pair of cylinders of the second engine block are bored simultaneously and chamfered at the top. Transferring brings the unmachined cylinders under the boring bars. By means of standard Ex-Cell-O cross-feed heads, the bottoms of the bores are also chamfered.

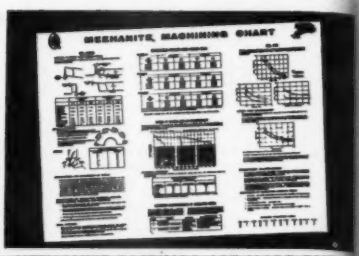


The design of the part, which is a two cycle engine block, necessitates the presence of several holes (intake and exhaust ports) in the walls of the cylinders themselves. At the finish boring station, an excellent finish is obtained despite this intermittent cut. A lateral movement of the fixture at the end of the boring stroke, permits the tools to rapid return, without leaving drag lines.

The parts are carried through the machine on pallets to ensure that the cast aluminum parts are not damaged during transfer. The machine, built by Ex-Cell-O Corporation, is hydraulically-operated throughout. Chip disposal is by underfloor conveyor and an automatic lubrication system is provided.

NEW SALES OFFICE SERVES DETROIT AREA

The S-P Mfg. Corp. has opened its new branch sales and service office in Detroit, offering customers in the greater Detroit area a complete sales and application engineering service covering S-P's line of air and hydraulic cylinders, chucks, and accessory items. John J. Scherer is the district sales manager heading this new office, with James C. Sprague assisting.



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The Hamilton Foundry & Machine Co., Hamilton, Ohio
Hardinge Company, Inc., New York, N. Y.
Hardinge Manufacturing Co., York, Pa.
Johnstone Foundries, Inc., Grove City, Pa.
Kanawha Manufacturing Co., Charleston, W. Va.
Kennedy Van Saun Mfg. & Eng. Corp., Danville, Pa.
Koehring Co., Milwaukee, Wis.
Lincoln Foundry Corp., Los Angeles, Calif.
Nordberg Manufacturing Co., Milwaukee, Wis. and St. Louis, Mo.
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
The Prescott Co., Menominee, Mich.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sonith Foundries of FMC, Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
The Stearns-Roger Mfg. Co., Denver, Colo.
Valley Iron Works, Inc., St. Paul, Minn.
Vulcan Foundry Co., Oakland, Calif.
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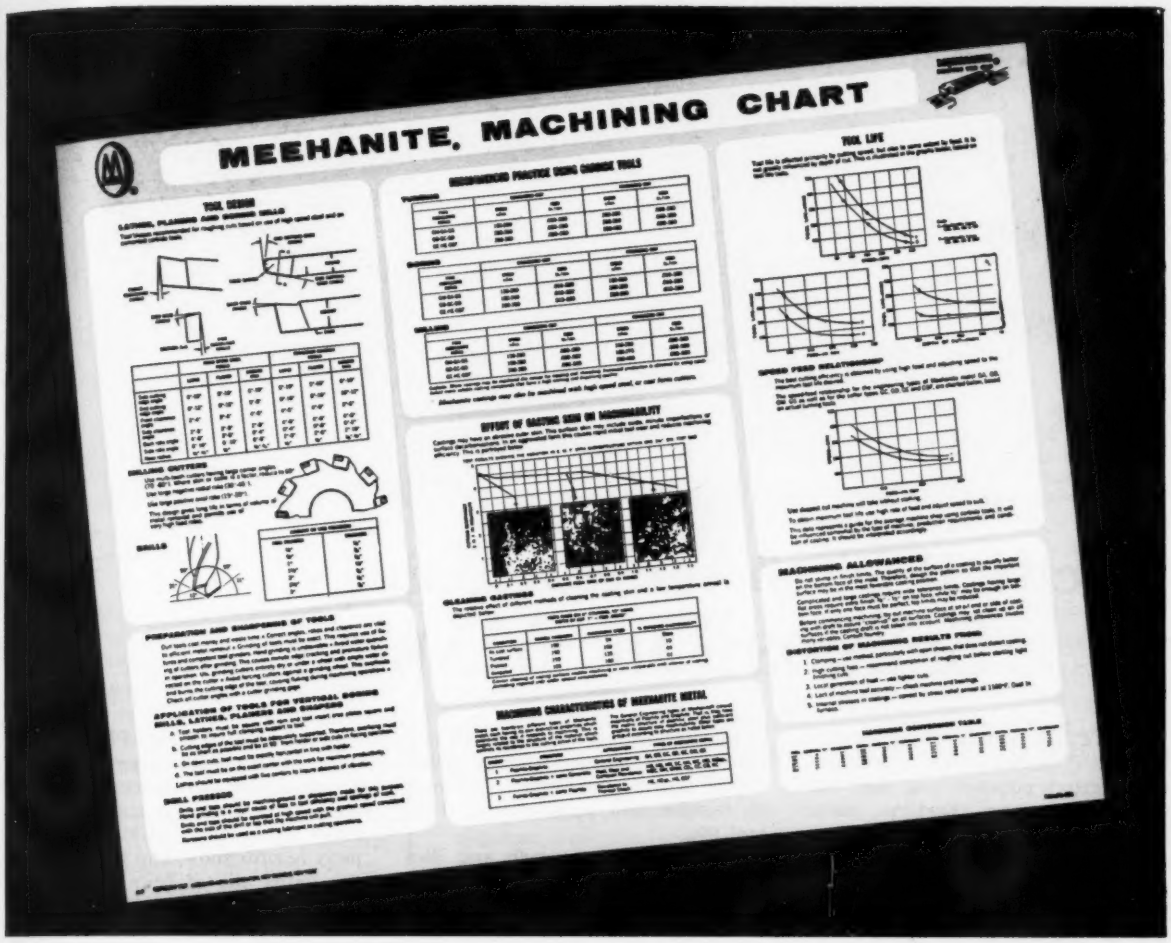
WRITE TODAY FOR YOUR FREE SINGLE COPY OF THE NEW MEEHANITE MACHINING CHART

MEEHANITE®

714 North Avenue, New Rochelle, New York.



New Meehanite Wall Chart presents useful data on machining castings

Designed as a working chart for use in every machine shop, this new, two color, 18 x 24 wall chart contains considerable machining data that has been heretofore unobtainable. This lack of data has created many problems and has placed foundries and machine shops at a distinct disadvantage, particularly in view of the fact that the cost of machining is often considerably more than the cost of the casting.

The extensive information presented in this machining chart is the result of years of research and development by the Meehanite Metal Corporation and Meehanite foundries throughout the world.

The various aspects of machining covered, include tool design for lathes, planers, boring mills, milling cutters and drills; preparation and sharpening of tools; applications of tools for vertical boring mills, lathes, planers and shapers, and drill presses; recommended practices using carbide tools; effect of casting skin on machinability; tool life, speed-feed relationship, machining allowances, etc.

If you would like a free single copy of this informative machining chart, please write today to the Meehanite Metal Corporation, New Rochelle, New York.

MEEHANITE BRIDGES THE GAP BETWEEN CAST IRON AND STEEL®

MEEHANITE METAL

MEEHANITE METAL CORPORATION, NEW ROCHELLE, NEW YORK

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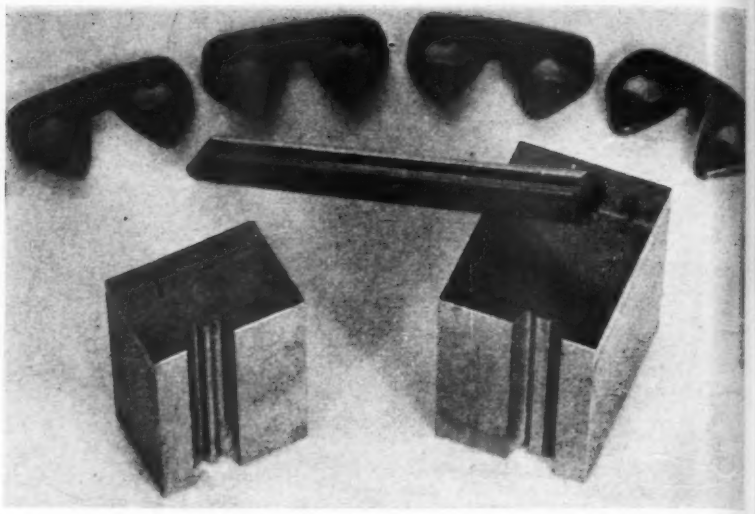


Fig. 1. Punch and die sections, produced faster by electrical discharge machining techniques, and chain links stamped by them.

Electrical Discharge Machining SPEEDS DIE MAKING

IN LITTLE MORE THAN HALF the time it formerly took to mechanically grind punches and dies for chain-making, an Eastern chain manufacturing company is electrical discharge grinding the punches and dies, and doing it more economically. They use an Elox-equipped 8" x 24" Cincinnati surface grinder with a brass "grinding" wheel — which is the electrode for electrical discharge machining — instead of a diamond wheel.

In operation, an electrical discharge of high frequency, low voltage, arcs between the electrode and the workpiece to erode the workpiece in the reverse shape of the form of the electrode. The electrode never touches the workpiece, so it cannot gall or score it, nor leave tool marks. The resulting matte finish on the punches and dies is uniform in texture and conducive to long tool life.

To machine the punch and dies shown, a form tool first dresses the brass "grinding" wheel. In this case, the form tool is machined to ±0.0002" because the company requires very accurately finished punches and dies. Then rough and finish passes are made over the workpiece.

To clean and load the fixture holding both the workpieces and the dressing tool, and to dress the Eloxing wheel for the roughing pass, takes 5 min a section. The actual roughing cuts take 7 min and 6 min, respectively, a section. Finish passes (after 5 min dressing operations) take an average of 24 min, for a total of 61 min. Total time to complete two matching sections is 81 min, company records show, and total time for the entire die of four shaped sections, 5.4 hrs. To mechanically grind the sections, the company estimates, would take 11 hrs per complete die, using diamond wheels.

For the piercing punches, 4 min per pass is required to dress the Eloxing wheel for roughing and finishing cuts. Twenty-one min of "Eloxing" time is required to rough and finish the first side, and 11 min for the second side. Thus, total electrical discharge machining time is 48 min for the carbide punch.

Before turning to electrical discharge machining, the company made the punches of steel. They estimate, however, that it would take 4 hrs to mechanically crush grind the punch in carbide, making a total of 15 hrs for punch and die against the Eloxing time of 8 hrs, 36 min. In addition, they estimate tool life expectancy to be 10 times greater with the carbide punch than with steel ones previously used. end

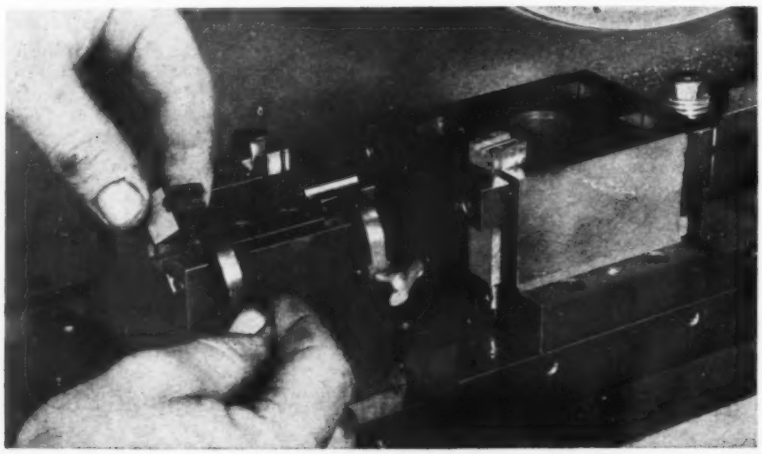


Fig. 2. One die section is removed after electrical discharge machining. At the far right of the fixture is the form tool used to shape the brass "grinding" wheel. Die sections are clamped in the left portion of the fixture.

Talking About Die Sets

with

Phil Marsilius

Executive Vice-President
The Producto Machine Co.

Die Set Maintenance in the Pressroom—The vital die-maintenance procedures required periodically when a die is removed from the press for sharpening should be coupled with systematic die set inspection and maintenance in the pressroom.

In addition to having a planned schedule of lubrication (based on any of the methods previously discussed in this space), you can make sure of getting the most out of your investment in die sets—and the costly dies and presses with which they are used—by following a simple set of procedures for inspecting and maintaining die sets in the pressroom.

Although there are no hard-and-fast rules that can be established for all die sets, the procedure listed below is generally followed at leading stampings plants in the East. These companies point out that die sets used in the cutting of extremely thin material or for very critical parts would naturally require a more stringent inspection than those used for blanking heavy material or for comparatively simple parts.

At one plant, specializing in long runs of close-tolerance parts for the electronics industry, the procedure followed is:

1. No inspection of the die set during production run unless, of course, there is overheating, pick-up on the guide pins or other obvious difficulties.

2. When the die is taken off the press for sharpening or maintenance, the die set is visually inspected for pick-up or score marks on either the guide pins or bushings. Pins and bushings are carefully cleaned to remove excess lubricant.

3. After approximately 1,500,000 strokes, the set is thoroughly checked for wear on both the pins and bushings. On the average, up to .0003″ wear on pins and bushings is allowed before replacement with new components is scheduled. In addition, the die set is placed on a surface plate and an indicator is placed over one end of the set. An attempt is then made to rock or twist the set by hand to establish how much the die set can be deflected. On a 10″ set, a maximum of .005″, but usually less, total deflection is allowed.

Because the die set plays such an important part in prolonging the accuracy and lifetime of a die, it pays to take the little extra time required to do justice to die set maintenance in the pressroom.

4. During regular or periodic regrinds, the die set is not checked for bent or distorted punch and die holders unless the die has been damaged or there is reason to believe the set may have warped.

During the overall period, if the pins and bushings are replaced, the punch and die holders themselves are checked for warpage or distortion. If necessary, these components are reground prior to assembling the new pins and bushings.

Four-stage blanking and shaving die, Lenkeit Machine & Tool Co., Inc.

Why the pressroom foreman prefers Producto die sets

They keep his downtime down

Keeping production *up* and downtime *down* is the main job of the pressroom foreman. He knows Producto die sets can help him do this job successfully because they maintain accuracy for long runs. All catalog steel sets are annealed to prevent distortion.

He is aware that Producto can provide him with any type of die set he needs—whether for standard or special presses—in a wide range of sizes and thicknesses, with or without clamping flanges.

The pressroom foreman knows that Producto guide pins are mirror-finished to eliminate scoring, and that Producto die sets are available with a variety of lubrication devices to keep them "running cool".

He knows, too, that he is not restricted to the use of predetermined press stroke or shut height because Producto offers an unlimited choice of pin and bushing lengths. Moreover, he can get the bolster he needs to protect his die at the same time he gets his die set. Both die set and bolster can be ordered in steel or cast semi-steel depending on strength requirements.

The pressroom foreman realizes that Producto Qwik-Fit Die Sets make "take-apart-and-put-together" easy during die maintenance. He also knows that Qwik-Fit removable pins and clamp-type bronze bushings are available when the application calls for them.

He can *produce more* with Producto die sets. So can you.

A WEALTH OF DIE SET KNOWLEDGE is packed into Producto's Catalog No. 11 and regular issues of *Die Set Digest*. Write today for these free aids.

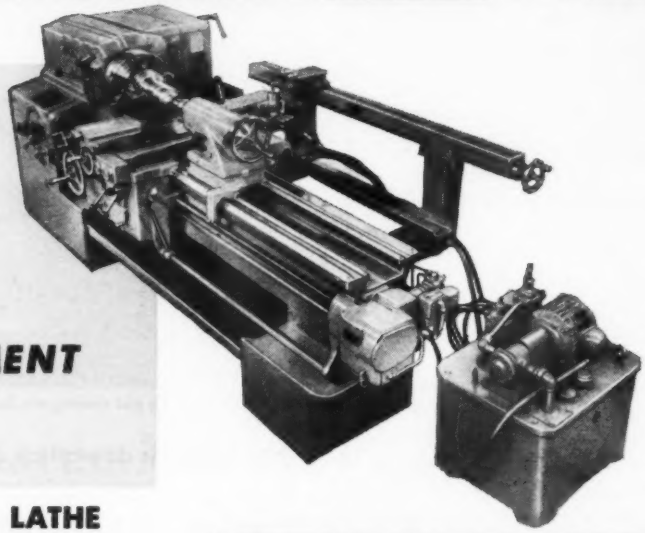
THE PRODUCTO MACHINE COMPANY
970 Housatonic Avenue, Bridgeport 1, Connecticut

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

Turchan introduces Trace-Matic



THE NEWEST, MOST REVOLUTIONARY FULL SWING TRACER ATTACHMENT FOR LATHES . . .

- DESIGNED FOR YOUR LATHE
- UNRESTRICTED SWING
- SIMPLIFIED CONTROL PANEL
- CARRIAGE MOUNTED CONTROLS

Turning large or small work on large or small lathes and obtaining 90° shoulders, opposing shoulders, tapers, radii and many other forms is simple with Turchan's new Trace-Matic Lathe Attachment. No re-chucking or re-centering is required. Duplication is uniform and continuous. Precision boring or turning is possible with uninterrupted cuts. Finish is excellent.

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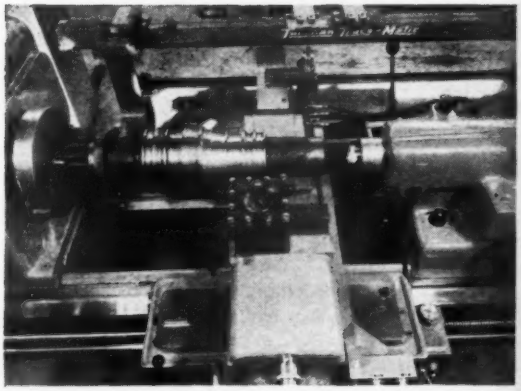
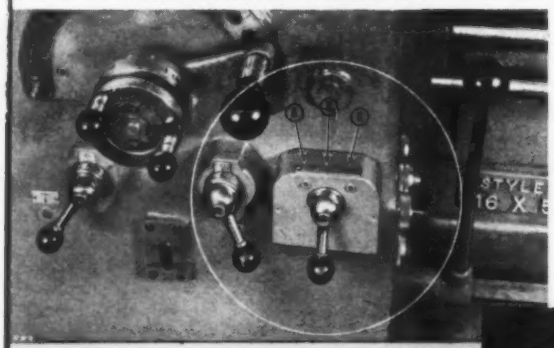
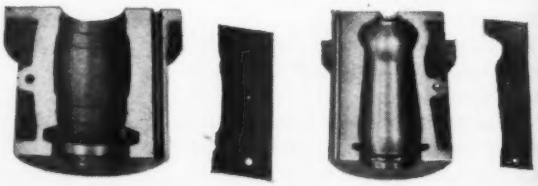


This rugged unit eliminates vibration and distortion—permits unrestricted swing—without additional slides. Tracer controls both longitudinal and cross feeds simultaneously to produce a constant feed rate regardless of contour.





Typical bottle molds bored with Trace-Matic

ONE LEVER CHANGE-OVER

(A) Standard Lathe Operation
(B) Tracing Operations
(C) Standard Thread Cutting

Effortless return to standard lathe operation.

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TURCHAN FOLLOWER MACHINE CO.

P. O. BOX 6055 • DEARBORN 9, MICH.

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STANDARD

PORT CONTOUR CUTTERS

Stocked for Immediate Shipment

Combines 5 Operations in One
All Tolerances
Well Within
AND 10050—MS-33514—
MS-35515 Specifications

A complete line of combination ream, counterbore and facing tools to form AND-10050 standards. Tube size 2 thru 32 carried in stock. Also tools for MS-33514 and MS-35515 carried in stock sizes 2 thru 20. Special tools made to order.

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HAND WHEELS

Straight Type Offset Type

SPECIALS

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- MACHINE HANDLES
- HANDLES
- BALL HANDLES
- LEVERS
- SPECIALTIES

GRADUATED DIALS

SPECIFY TOMCO FOR DEPENDABILITY

A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.

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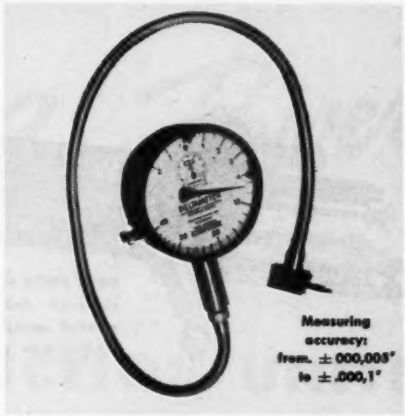
JOHANSSON GAGING EQUIPMENT

Assures You Precision to the Finest Degree to Meet Your Requirements —Backed by the Name Supreme in the World of Measurement



Measuring accuracy: from ± .000,005" to ± .000,1"

GAGE BLOCKS

(JOHANSSON) and accessories. Short deliveries. Inspection and reconditioning service available at our plant.

INTERNAL INDICATORS

(for inside measurements .155 to 24 inches). Scale range plus or minus .001 graduated to .0001 and minus .020 graduated to .0001.

MIKROKATOR

(Amplifier—for outside measurements) Graduations .0001 to .000001 or .01M to .0002M.

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Micrometers, Snap Gages, Extensometers, Dynamometers, Hardness Testers, Surface Finish Indicators, Interferometers, Plugs, Rings and Special Gages.

CEJ-DELTAMETER
For Automatic Sizing

This pneumatic measuring instrument is intended for automatic machine control and for sorting of mass produced parts.

With the application of the CEJ-DELTAMETER to your machines you will get more accurate and uniform products...less rejected parts...less inspection as parts are already inspected when leaving machine. The CEJ-DELTAMETERS are applicable to such machines as ID- and OD-grinders, Turret Lathes and Rolling Mills as well as Sorting devices and many other special built machines and measuring fixtures. There are *four different types* of Gage Heads available. The Type I when adapted to an Internal Grinding Machine can automatically control the grinding operation to size of the part and even dress the grinding wheel before the finish grinding. When the part is ground to size the machine is automatically cut out. Other types are A, O and S applicable on turret lathes, O.D. grinders and for special applications.

Write for Literature

C. E. JOHANSSON GAGE CO.

A DIVISION OF SWEDISH GAGE CO.

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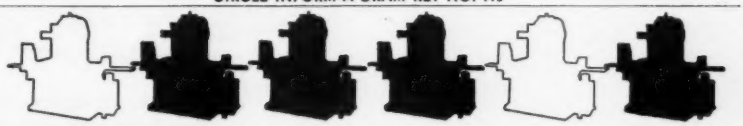
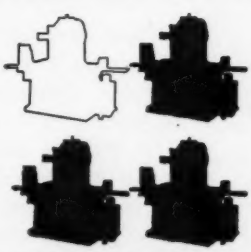


SEVEN OUT OF EVERY TEN

GRAND RAPIDS GRINDERS...



— are purchased by firms already owning one or more of them. Three out of every 10 sold go to new customers. Once you've enjoyed the advantages of a Grand Rapids Grinder in your plant, chances are, like so many present users, you'll surely want more of them.

Write for 24-page book that tells you why.

GALLMEYER & LIVINGSTON

GALLMEYER & LIVINGSTON CO.
495 Straight Ave., S.W. Grand Rapids, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 914

YOU CAN CUT COSTS 30% OR MORE RI

DRILL PRESS FEEDS — Quickly attached to any standard drill press, these units replace manual control of feed rates with automatic air-hydraulic precision control.

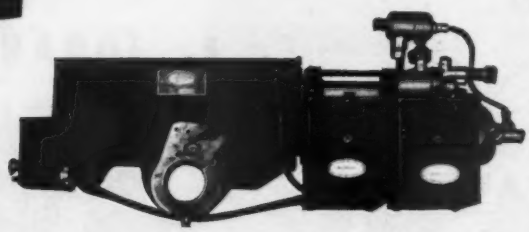
ROTARY FEED TABLES — matic and accurate p work pieces for drilling, welding, etc.

SHUTTLE WORK FEEDER — A 2-station linear 6" stroke work feeder... load or unload while drilling, tapping, etc. is being done at other station.

THE BELLOWS AIR MOTO cylinder with the integra speed controls, for low 115-volt control circuits.

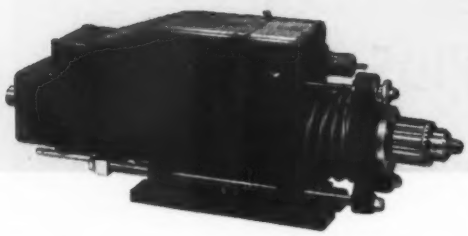
"CONTROLLED-AIR-POWER" VISE — Quick acting air vise for fast tool and fixture work; clamping pressure approximately five times air line pressure.

AIR-HYDRAULIC VISE — A milling machine type vise developing a clamping pressure up to 15,000 lbs. on 100 lbs. operating air line pressure.



HEAVY DUTY POWER FEED—A complete packaged power unit designed primarily to replace manual infeeding in centerless grinding operations.

AIR PRESSES—Provid a controlled pressure for pressing operation sharp impact for st coining or staking.



BELLOWS-LOCKE DRILLING and TAPPING UNIT— An air-powered hydraulically controlled drill unit for quick incorporation into high production drilling or tapping operations.

These Bellows work units are air-powered but electrically controlled. Directional valving and speed controls are built-in. Only a single air connection is required which can be made with flexible air hose. All units can be interlocked and synchronized with one another for programmed operation. Economical to buy, simple to install, they give immediate cost cutting results to any plant in any industry.

...OW WITH THE HELP OF THESE

Bellows "Controlled-Air-Power"

PRODUCTION UNITS

Bellows production units are pneumatic powered devices that are easily installed on standard machines to make them operate automatically. They save costs by cutting the time of the work cycle; by grouping related operations on one machine often saving the complete labor cost of the second operation; by making it possible for one operator to run two or more machines; by maintaining quality standards with fewer rejected parts; by using lower hourly-rated employees to turn out top quality work.

You can install Bellows work units right in your own plant, with your own tool room personnel, with a minimum of machine downtime (often no more than a couple of hours.) In many cases, Bellows Field Engineers can provide you with wiring diagrams and schematic drawings right from their case history files, and with information that will enable you to estimate *quickly* the cost savings you can make.

Best of all, the initial cost to buy and install Bellows "controlled-air-power" work units is small — often less than the wage cost of a machine operator for a couple of weeks.

The Bellows Co.

DIVISION INTERNATIONAL BASIC ECONOMY CORPORATION

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...f you do any of these typical operations, you can ...art an effective cost cutting program by mailing ...e coupon at the right.

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EXCLUSIVE IN DoALL SAFETY CENTER DRILLS

Here's why costs take a tumble with these new DoALL Center Drills:

Radial Type—This new precision-ground *curve* now eliminates the old fatigue point found in standard drills—the familiar sharp notch where the 60° angle meets the drill portion. This new radius angle provides greater strength and gives tip clearance to the drill portion. This provides the ultimate in minimizing breakage. Corners are automatically deburred. It also reduces friction between lathe center and work... provides a larger oil reservoir. Center grinding is eliminated on hardened parts. Lapping is fast and easy.

Heavy-Duty Type—Cuts an entirely new type of burr-free center. An 82° ground top angle forms a cutback edge. There is a slight radius where the 60° angle meets the drill portion—no sharp notches! Provides a larger bearing surface for heavier parts as compared to the radial type.

Think of it! These longer-lasting, faster-cutting DoALL Safety Center Drills cost no more than the old plain type—and actually cost 10% to 15% *less* than ordinary bell types.

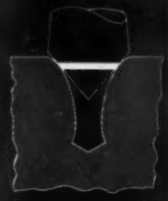
That's why more and more alert men have changed to DoALL. Try it—and see the difference!

Only DoALL offers ALL these features:

- Less drill breakage
- No fatigue point
- Greater drill strength
- Higher cutting efficiency
- Resharpenable
- Perfect work centering

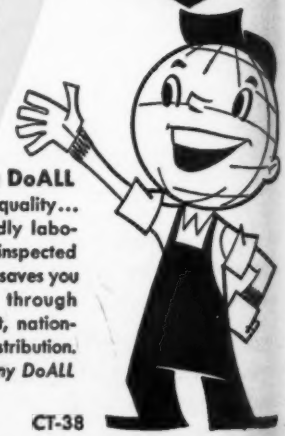
—PLUS still more cost-cutting opportunities:

Deburring eliminated
Center grinding eliminated
Lathe-center damage eliminated



Radial Type Drilled Hole

Heavy-Duty Type Drilled Hole



If it's a DoALL it's top quality... it's rigidly laboratory-inspected ...and it saves you money through low-cost, nation-wide distribution.
—*Danny DoALL*

CT-38

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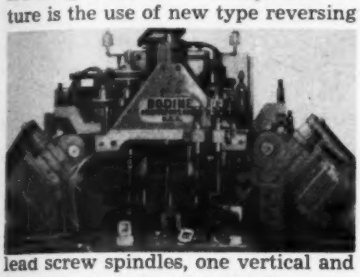
BASIC MACHINE FEATURES UNUSUAL SPINDLE ARRANGEMENT

Six separate drilling, tapping, and deburring operations are performed on an intricate zinc die cast valve body by this Bodine machine. The spindles are mounted to operate vertically from both above and below the index table, and angularly from right and left. An unusual feature is the use of new type reversing

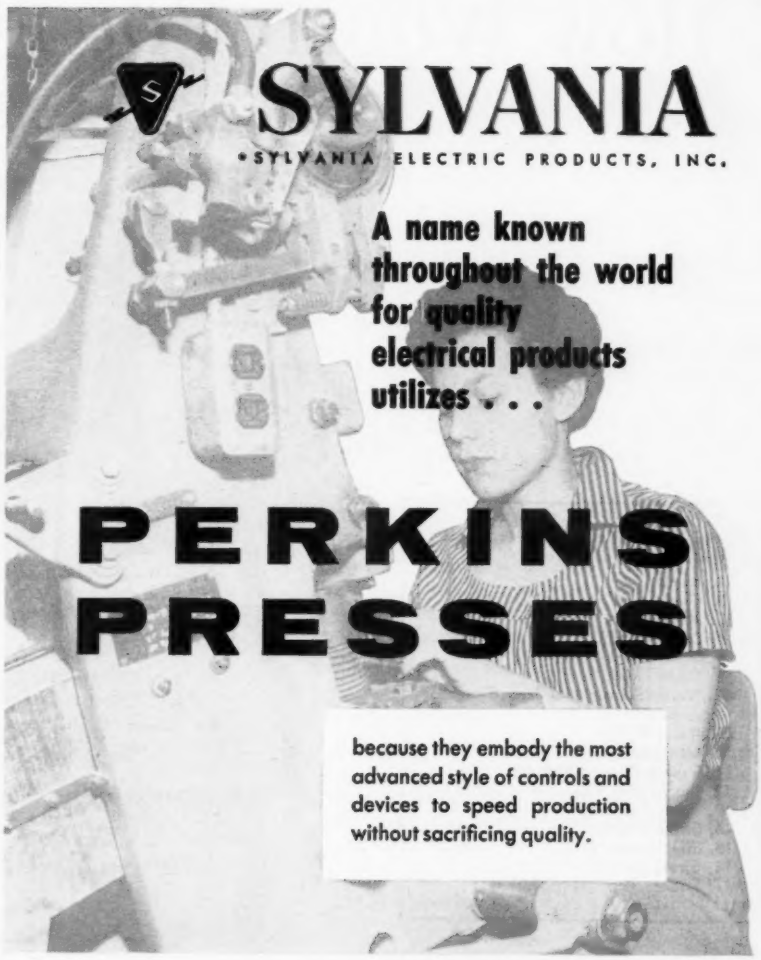


lead screw spindles, one vertical and one inverted, for the N.P.T. operations. Parts are hand-loaded, then auto-clamped. At the end of the cycle, parts are auto-unclamped, auto-lifted and hand-unloaded. Production is 15 completed pcs/min, more than 6000 operations/hr. Since both the basic machine and spindle units are essentially standardized, retooling for possible model changes or even for another part can be accomplished with a high degree of salvability.

SIX AIR-CLAMPS REPLACE EIGHTEEN HAND CLAMPS

Milling the channel on a vacuum column — a major component of magnetic tape units for IBM machines — at Arrow Tool Company, Inc., required that the method of holding the part be rapid and positive in its action. To improve on

the former method of using 18 separate hand clamping operations, six Mead V-7 air-clamps are now installed on the Milwaukee milling machine. These six clamps respond instantly to the touch of a single valve by the operator, thus locking the workpiece in place along its entire length and assuring equal pressure at all points regardless of strain and vibration.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•SYLVANIA ELECTRIC PRODUCTS, INC.
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PERKINS PRESSES
because they embody the most advanced style of controls and devices to speed production without sacrificing quality.

PERKINS PRESSES also offer a wide choice of accessories to make their standard inclinables adaptable to the widest possible range of job assignments.

LET OUR ENGINEERS SHOW YOU HOW . . .

Perkins Presses can become an integral part of the production process in your plant.

Write Dept. TP-3 for complete technical information.

Call in a Perkins field engineer and let him help you get maximum production in your press room.

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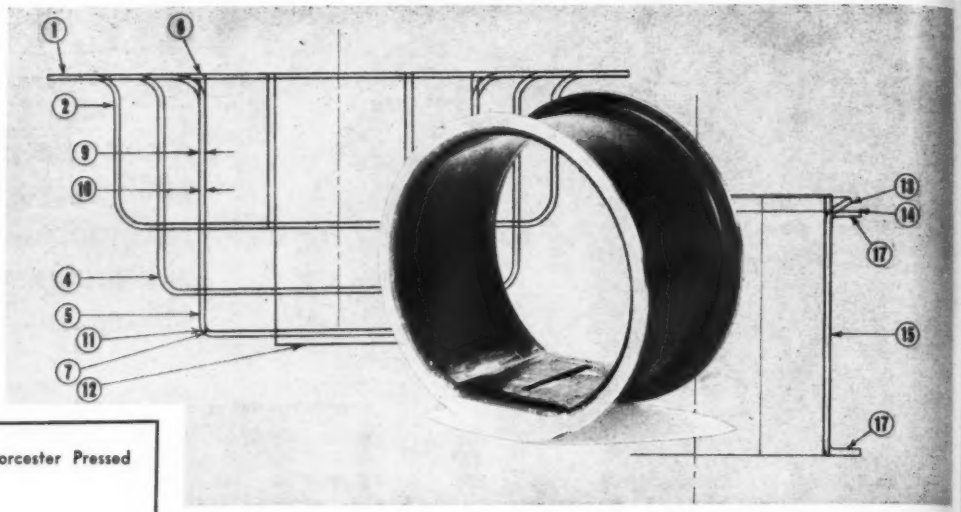
HOW WOULD *YOU* FORM THIS?



Here is how the Worcester Pressed Steel Co. did it.

1. Blank
2. Draw
3. Anneal
4. Draw (Neck)
5. Draw (Neck)
6. Strike Fillet
7. Pierce Bottom and Trim Flange
8. Anneal
9. Iron (Wall)
10. Iron (Wall)
11. Square Pierced Bottom
12. Notch Flat Projection (2 strokes)
13. Form Second Flange 45°
14. Strike Flange
15. Size (Diameter)
16. Stress Anneal
17. Square Trim Flange

It is our impression that the average engineer thinks in terms of less drastic reductions (than shown here) when he thinks of stamping. Not that some of you are not aware of the extreme deformation possibilities of a press, but sometimes a "fresh up" is appreciated. That is the intention behind this short stamping story. Even those of you who are aware of stamping reductions like this one, will probably admit it's a good trick.

AN IMPORTANT AVENUE TOWARD PROGRESS in the stamping industry — or any industry — is a willingness to experiment; a refusal to adhere rigidly to rule and rote. New problems are constantly arising, and all available experience as well as extensive development work are often required for their solution.

Worcester Pressed Steel recently worked out the answer to the problem of stamping a cylinder with a flange on both ends from a *flat blank* of cupro-nickel. The part is a component of a magnetron unit which is made by Raytheon Manufacturing Company. Extremely high quality standards had to be met, since this tube was to be the heart of military radar equipment playing a vital part in the defense of our country.

Because of its special physical and metallurgical properties this particular cupro-nickel was the most suitable metal for the job. Unfortunately this copper-base alloy is tough and rigid with great resistance to deformation; maintaining "as worked" dimensions presented serious problems.

One difficulty was that the metal tended to thin rapidly in forming, thus making it almost impossible to maintain the necessary constant thickness. Another difficulty was the cracking that occurred during the flanging operations. These problems were present due to excessive stretching of the material.

Still another problem: Copper anodes in a series of built-up laminations had to be pressed into the ring. To ensure good thermal transmission for successful operation of the tube, intimate contact had to be established by providing an exact fit between this ring's ID and the anodes soldered inside. This called for close dimensional control of the inside diameter of the ring.

Several logical fabrication alternatives were considered, each having their drawbacks. Welding was not permissible, and suitable tube stock was not available. So stamping was the process chosen. Its cost factor was favorable due to minimal machining operations and no assembly work. Beside this, optimum physical characteristics and a good surface — both features of prime importance — were assured.

Worcester Pressed Steel Co. solved the stamping problem through basic design changes, and specialized experience in "problem stamping."

This inherently stiff cupro-nickel alloy displayed an unpredictable tendency to move after the part was withdrawn from the die, a condition defeating first attempts at close inside tolerance control. However, through trial and error, tempered by experience, the problem was solved. Oversized punches were developed that would allow proper spring back to within tolerances. This, coupled with ironing operations on the inside of the drawn shell, brought about two-dimensional accuracy.

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Alcoa Offers Screw Stock In Specific 12-ft. Lengths, No Increased Cost
PITTSBURGH, Aug. 30, 1958—Aluminum
Alcoa Adds Alloys 2024-T4, 6061-T6 to Screw Stock Schedule
PITTSBURGH, Nov. 11, 1957—Alu-
minum Company of America
Alcoa Extends Range Of Chamfered Ends At No Extra Cost
PITTSBURGH, Jan. 21, 1957—Alumi-
num Company of America today increased
Alcoa Stress Relieves Screw Machine Stock
PITTSBURGH, July 8, 1957—Stress-relieved
screw machine stock offering better machining charac-
Alcoa Backs Distributor Stock With Mill Inventory
PITTSBURGH, March 18, 1957—Alu-
pany of America announced today
its Massena plant will be
Alcoa Buys Turnings And Borings
PITTSBURGH, April 1, 1958—Alumi-
num Company of
ALCOA
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"ALCOA THEATRE"
Exciting Adventure
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THE BIG NEWS IN SCREW MACHINE STOCK COMES FROM ALCOA

We think there's more to service than making the best screw machine stock readily available in any quantity. ALCOA is consistently a step ahead with new economies, new design and production conveniences. Here are six ALCOA "firsts":

- Specific 12-ft lengths at no extra cost—all screw stock in rounds to 2⅜ in. dia. and hexagons to 2 in. across flats.
- Alloys 2024-T4 and 6061-T6 added to Screw Stock schedule. This means important economies through the addition of sizes formerly nonstandard which are now standard and groupable for price advantage.
- Chamfered ends at no extra cost for all rounds and hexagons up to 3 in. in alloys 2011-T3, -T8, 2017-T4, 2024-T4, 6061-T6.
- Full screw stock size range of alloys 2017-T4, 2024-T4, 6061-T6 stress relieved for improved machining characteristics.
- Mill inventory to supplement distributor stock and cover emergency requirements of mill customers.
- ALCOA agrees to purchase up to 60 per cent of customer's turnings and borings generated from alloys 2011-T3, 2017-T4, 2024-T4 and 6061-T6.

These and other reasons are behind the switch today to ALCOA® Aluminum Screw Machine Stock. Send in the coupon for your copy of *Alcoa Aluminum in Automatic Screw Machines*, the standard procedures manual for production men.

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876-J Alcoa Building, Pittsburgh 19, Pa.
Please send my copy of *Alcoa Aluminum in Automatic Screw Machines*.

Name _____
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Company _____
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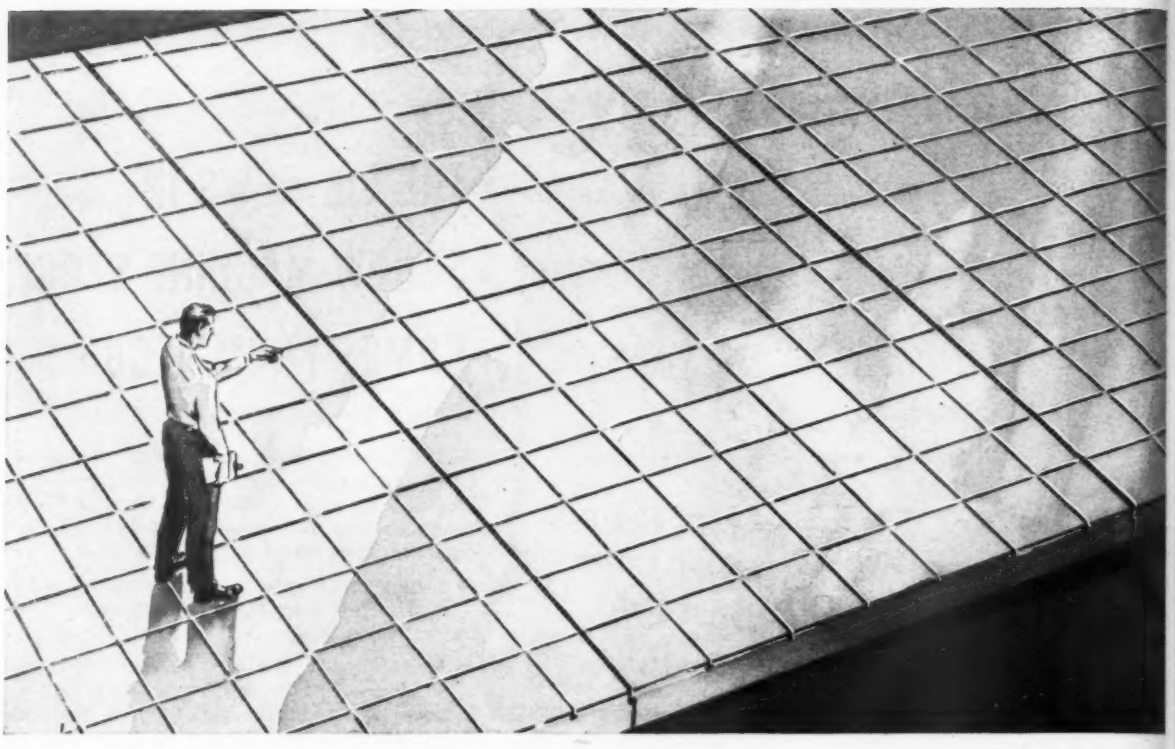
CIRCLE INFORM-A-GRAM KEY NO. 97

HOW BIG A SURFACE DO YOU NEED?



Now . . CHALLENGE® OFFERS PRECISION SURFACE PLATES in 22 FOOT UNITS

To meet the growing need for large precision surfaces for accurate layout, welding or as bases for machine tools, Challenge now offers plates in units up to 22 feet in length and 10 feet in width.

These can also be combined together as units of sectional plates into accurate surfaces of much larger size. Tolerances over the entire surface of each single piece unit are .002 of an inch with an overall accuracy of assembled units of .005 of an inch.

These Challenge 22 foot Semi-Steel Surface Plates are available as Floor Plates or as Layout Plates on stands. They can also be supplied with scribe lines and tee-slots, to aid in locating and positioning the work.

Challenge offers the broadest line of precision surface equipment — much of it specially engineered to meet specific customer needs. When you have a need involving precision surfaces, write Challenge or ask for our catalog 838W.

Challenge

SE-119

THE CHALLENGE MACHINERY COMPANY • GRAND HAVEN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 98

Albany 1, N. Y.
Eastern Metals Warehouse, Inc.
ALbany 89-3281

Birmingham 5, Ala.
Allegheny Ludlum Steel Corp.
FAirfax 2-0548

Buffalo 7, N. Y.
Brace-Mueller-Huntley, Inc.
Victoria 8700

Cambridge 38, Mass.
Acorn Steel Company
HAncock 6-9592

Charlotte 1, N. C.
Edgcomb Steel Company
FRanklin 5-3361

Chicago 32, Ill.
Allegheny Ludlum Steel Corp.
LAfayette 3-8650

Chicago 32, Ill.
U. S. Steel Supply Div.
BRunswick 8-2000

Cincinnati 1, Ohio
Allied Abrasives & Tools, Inc.
MUlberry 1-2222

Cleveland 3, Ohio
Allegheny Ludlum Steel Corp.
UTah 1-0500

Dallas 22, Texas
Peery Steel Company
FEderal 1-4354

Dayton 4, Ohio
Allegheny Ludlum Steel Corp.
HEmlock 8386

Denver 16, Colorado
Union Supply Co.
AMherst 6-2292

Detroit 20, Mich.
Allegheny Ludlum Steel Corp.
JOrdan 4-6900

Flint 1, Mich.
Hall Steel Co.
CEdar 4-6672

Grand Rapids 8, Mich.
Good Steel Service, Inc.
CHerry 1-4425

New York 17, N. Y.
Allegheny Ludlum Steel Corp.
MUrrayhill 2-0369

Philadelphia 34, Pa.
Edgcomb Steel Co.
GArfield 3-6300

Rochester 1, N. Y.
Brace-Mueller-Huntley, Inc.
COngress 6-6560

San Francisco 7, Calif.
Allegheny Ludlum Steel Corp.
GArfield 1-1804

Shelton, Conn.
Trico Manufacturing Co.
EDison 7-6214

St. Louis 8, Mo.
Allegheny Ludlum Steel Corp.
JEfferson 3-6700

Springfield 1, Mass.
Allegheny Ludlum Steel Corp.
REpublic 4-4996

Syracuse 1, N. Y.
Brace-Mueller-Huntley, Inc.
HOward 3-3341

Worcester 8, Mass.
Pratt and Inman
PLeasant 6-9592

York, Pa.
Edgcomb Steel Co.
47-1411

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Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.
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WSW 7285

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Tool Steel warehouse stocks throughout the country... Check the yellow pages

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CIRCLE INFORM-A-GRAM KEY NO. 99

form INTERNAL THREADS without cutting

X-PRESS TAPPING METHOD
Stronger threads. Grain fibers unbroken. Metal compacted and hardened.
Burnished thread, no cutting.
NO CHIPS

BESLY X-PRESS® TAPS

CONVENTIONAL TAPPING METHOD
Produces chips that may clog flutes, cause loading. Result—excessive breakage.
Grain lines of metal are cut.
CHIPS

New Revolutionary Tapping Principle Cold Forms Internal Threads In . . .

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- LEAD
- DIE CASTINGS
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BESLY X-Press Tapping is a cold forming or swaging process for producing internal threads in ductile metals. The desired thread is formed under pressure. The grain fibers follow the contour of the thread, as in good forgings. They are not cut away as in conventional tapping methods. Complete application details are available — see your Besly distributor, or send coupon. *Where this new tool can be successfully applied the results are* phenomenal! *It would pay you to try them yourself — NOW!*

"SR" Style X-Press Taps—for through or bottoming holes.

"P" Style X-Press Taps—for through holes, or bottoming holes with ample clearance.

"B" Style X-Press Taps—for bottoming holes only.

"PC" Style X-Press Taps—same work as "P" Style series, except the root diameter controlled at 75% of thread.

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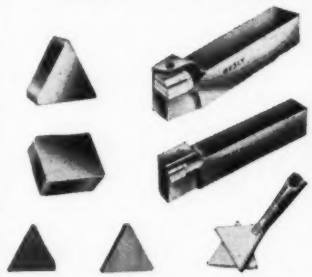
BESLY *Complete* CARBIDE SERVICE

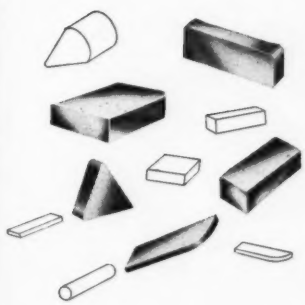
Lapped TOSS-AWAY INSERTS and HOLDERS



Commercial Finish | Besly Finish | Lapped, perfectly flat surfaces easily wring together.

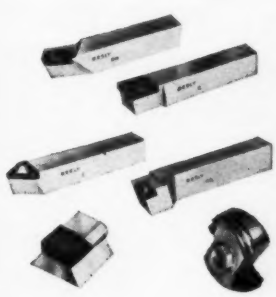
Special Besly lapping process gives more tool life per cutting edge with less chipping and breaking. Wide range of sizes, positive and negative rakes. Holders in styles and shank sizes to fit the job.

BLANKS



In sizes, grades and styles for every cutting need. Standards include: reamer blanks, lathe center blanks, rectangular strips, solid cylinders, pulley grooving blanks and others. "Specials" made to order.

TIPPED TOOLS



Standard tools supplied in a variety of grades, sizes and styles for turning, facing, boring, chamfering, planing, milling, end cutting, threading and grooving in cast iron, non-ferrous, steel and steel alloy metals. Modifications and "specials" made to fit specific jobs.

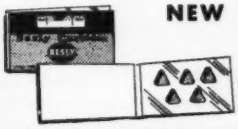
only tools with perfect radii...

...means that BESLY carefully makes every Carbide Tool to the highest standards of **accuracy** and **quality**

Only the best materials and methods are used in their development — advantages which give you longer life, less downtime, fewer rejects and higher production rates at lower cost.

A complete range of standard styles and sizes is always available for *overnight delivery* through your Besly distributor. Ask him for Catalog 857 and for Besly's super-service on "specials."

NEW PACKAGING



Skin-Pak for Inserts and Blanks

Lapped toss-away inserts, carbide blanks, in standard package quantities, are conveniently arranged on 3" x 5" file card size fold-over cardboard pack secured with transparent polyester film for complete protection. Besly's new package prevents chipping of cutting edges and insures perfect condition, ready for instant use.

Plastic-Pak Cigarette Box for Tipped Tools

Standard tools inserted in Styrofoam and packed in individual, attractive plastic "cigarette" boxes. Provides easily identified, handy, fully-protected tool packages always ready for use.

SEE YOUR BESLY DISTRIBUTOR OR WRITE FOR CATALOG 857

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Engineering, Service and Specials . . . are a Besly specialty

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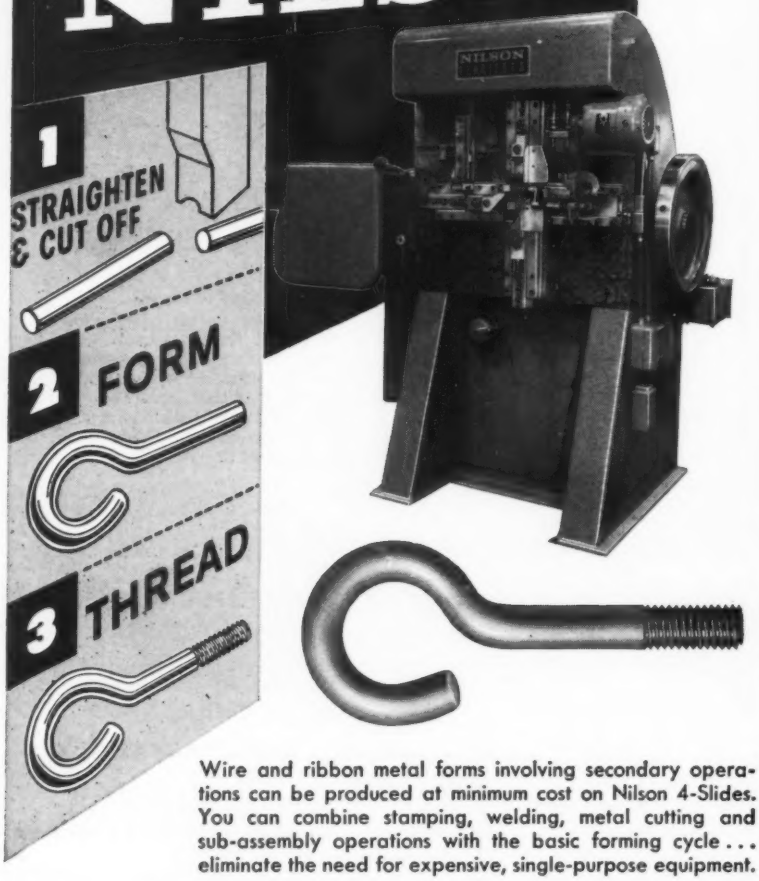
GRINDERS and ABRASIVES • TAPS • X-PRESS TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES • CARBIDE TIPPED TOOLS, BLANKS, LAPPED TOSS-AWAY INSERTS and HOLDERS

CIRCLE INFORM-A-GRAM KEY NO. 101

NILSON 4-SLIDES FORMING PRODUCTION PROFITS... *Automatically*

COMBINE OPERATIONS on a NILSON



Wire and ribbon metal forms involving secondary operations can be produced at minimum cost on Nilson 4-Slides. You can combine stamping, welding, metal cutting and sub-assembly operations with the basic forming cycle . . . eliminate the need for expensive, single-purpose equipment.

The Nilson "Vertiform" shown above, for example, has a die head mounted on the right-hand forming slide. Wire stock is straightened, cut off, formed and threaded—all automatically in one cycle!

In addition to the new "Vertiform," Nilson builds 17 models of horizontal 4-slides, including 5 ribbon metal machines with built-in press units. For a new approach to low-cost production of wire forms and small metal stampings, it will pay you to get in touch with Nilson.

Send today for the Nilson General Catalog on Automatic 4-Slide Equipment!

NILSON
THE A. H. NILSON MACHINE CO.
1503 Bridgeport Avenue • Shelton, Conn.
AUTOMATIC WIRE & RIBBON METAL FORMING 4-SLIDE MACHINES • WIRE & STOCK REELS • WIRE STRAIGHTENING EQUIPMENT • AUTOMATIC STAPLE FORMING MACHINES • SPECIAL WIRE FORMING EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 102

MEN YOU SHOULD KNOW

Two new plant superintendents have been appointed by Russell, Burdsall & Ward Bolt and Nut Co. **William H. Schmidt** serves at Port Chester, N. Y., after serving as superintendent in Los Angeles, and **Olof V. Johnson,** former machine shop supervisor, replaces Schmidt in Los Angeles.

Taking over as vice president of manufacturing of Titeflex, Inc. is **George A. Lagassa.**

E. D. Vancil, manager of Meta-Dynamics Division, recently was elected vice president of the parent organization, The Cincinnati Milling Machine Co. Assistant export manager, **L. E. Eberts,** moved up to vice president of Cincinnati Milling's sales subsidiary, Cincinnati Milling and Grinding Machines, Inc.

Election of **S. L. Crawshaw** as a vice president of Philadelphia Gear Corp. has been announced. He will direct the company's new high precision gear grinding activities.

New vice president and works manager of Nelco Tool Co., Inc. is **Robert A. Warfel,** formerly superintendent of new product development for Nelco.

Former vice president, **H. R. Wimmersgerger** has taken over as president and treasurer of Pittsburgh Tool Steel Wire Co., following the retirement of **Ralph H. Pauley.**

National Carbide Die Co. has appointed **Werner Pflug** vice president.

New vice president and general manager of Allied Products Corp. is **Robert A. Niemi.**

Youngstown Kitchens Division of American Standard announces the following promotions: **H. O. Smith,** to vice president and general manager of contract stamping operations; **M. L. Ondo,** vice president of product development; **Harry F. Howell,** vice president of marketing; **Carl Eversman,** manager of kitchen manufacturing; **John A. Spier,** division controller; and **Francis L. Maus,** manager of industrial relations.

Appointment of **L. B. Smith** as executive engineer for AC Spark Plug Division of General Motors has been announced. He was formerly chief test engineer and succeeds **C. G. Davey,** who has retired.

Election of **Bernard T. Brennan** as president and chief executive officer of Anti-Corrosive Metal Products Co., Inc. has been made known.

. . . *Continued on Page 105*

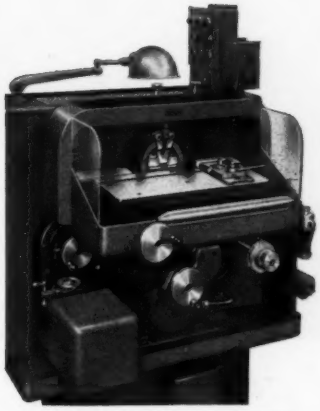
MISSION ACCOMPLISHED!

Hammond presents

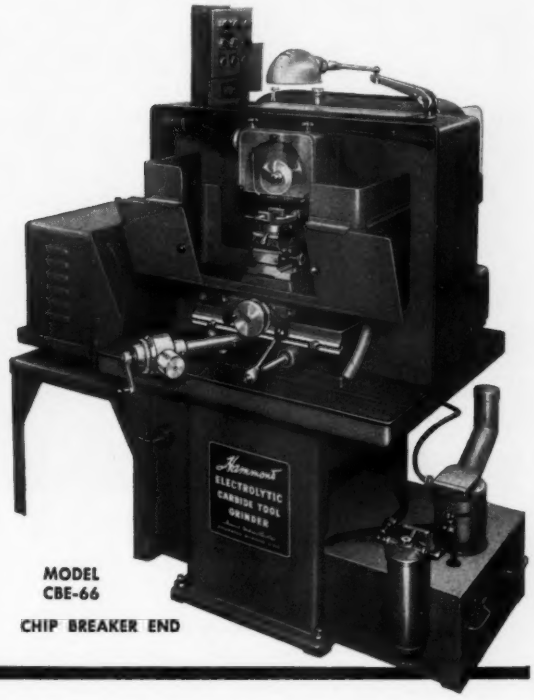
NEW ELECTROLYTIC CHIP BREAKER AND OSCILLATING CUP WHEEL GRINDER

FOR CARBIDE TOOLS

SPECIALLY DESIGNED FOR THE ELECTROLYTIC PROCESS



OSCILLATING CUP WHEEL END



MODEL CBE-66
CHIP BREAKER END

The NEW Model CBE-66 Electrolytic Combination Chip Breaker and Oscillating Cup Wheel Grinder is an ideal "all around" Grinder for single point carbide tools and insert slugs as —

- The cup wheel has variable oscillation and the automatic "pushbutton" air table can be furnished.
- For chip breaker grinding the oscillation is NOT used and a manual lock with electrical interlock prevents movement of the spindle.

Designed especially for the Anocut Electrolytic Process, the CBE-66 provides all the proven advantages of electrolytic carbide tool grinding — easier, faster and better grinding, reduction of 80% to 90% in diamond wheel consumption and elimination of heat fractures.

If your requirements do not justify two machines — one for cup wheel grinding, the other for chip breaker grinding, the CBE-66 is the answer. Write for catalog.

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1631 DOUGLAS AVE. • KALAMAZOO, MICHIGAN

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CIRCLE INFORM-A-GRAM KEY NO. 103

FOR THE DIEMAKER WHO HAS EVERYTHING...

. . . everything but a good source for die sets,
here's a suggestion.
Die sets are basic to mass production.
They don't need
gadgets, gimmicks or glamorous-styling.
Production depends on
sound design, quality materials, accuracy
and reliability, and
at reasonable cost and delivery time.
That's the way it is
with Detroit die sets. Why don't you
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OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

CIRCLE INFORM-A-GRAM KEY NO. 104

. . . Men from Page 102

Appointment of **Oscar L. Dunn,** general manager of the Direct Current Motor and Generator Dept. of General Electric Co., to succeed **James M. Crawford** as general manager of the Motor and Generator Division, has been announced.

The appointment of **O. F. Keeler** to the new position of manager-product planning analysis at Dodge Division, Chrysler Corp., has been made known. His responsibilities include car planning coordination, market and merchandising analysis, including competitive analysis and advance product cost analysis functions.

Personnel changes have been announced by Brown & Sharpe Mfg. Co.: **William A. McGregor** takes over as general manager of Brown & Sharpe, Ltd., in England; **Earl P. Leeds** will serve as director of federal government sales, reporting to the Machine Tool Division; **Thomas C. Roberts** is the new manufacturing manager, Industrial Products Division; and **Lester J. Corser** has been promoted to director of manufacturing.

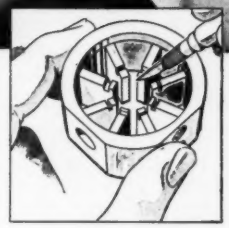
Friez Instrument Division of Bendix Aviation Corp. announces the promotion of **Vernon D. Hauck** from assistant general manager to general manager, succeeding **LeRoy D. Kiley.** Filling the new position of general manager of the Cincinnati Division is **L. E. Rasmussen,** former plant manager.

Two promotions of vice presidents of the Package Machinery Co. have been announced. **Harold Mosedale, Jr.,** former vice president of engineering, is now in charge of sales for both Package Machinery equipment and Reed-Prentice machinery. **Edward W. Forth** continues as vice president of Reed-Prentice engineering and is now also in charge of Package Machinery engineering.

George F. Dun, recently named technical assistant to the executive vice president of Emhart Mfg. Co., will be in charge of improving company manufacturing techniques and will assist in design analysis of new and existing products.

Yale Materials Handling Division, The Yale & Towne Mfg. Co. announces the appointment of **Francis J. Dunleavy** as manager of the Philadelphia plant. Moving up from superintendent of assembly to manager of production is **Robert L. Hoyt.** He succeeds **George A. Smith,** who has been placed in charge of special division projects for the general manager.

. . . *Continued on Page 106*



YOU TOO CAN REDUCE REJECTS!

Anton Machine Works, Brooklyn, manufacture magnetron anodes for radar, Geiger counter, X-ray and transmitter tubes.

PROBLEM: Minute burrs must be precisely removed from magnetron anodes . . . without altering contours. Accurate deburring is absolutely essential to eliminate deflections that change tube frequency.

SOLUTION: Operators use AO Spencer Stereoscopic Microscopes to effectively view and remove burrs with a small scalpel.

RESULT: Rejects practically eliminated. Productivity substantially increased.

You, too, may have a deburring problem . . . or other problems involving surface quality, measurements or assembly of small components. If so, why not investigate the most modern . . . versatile . . . and complete line of Stereoscopic Microscopes.

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GENTLEMEN:
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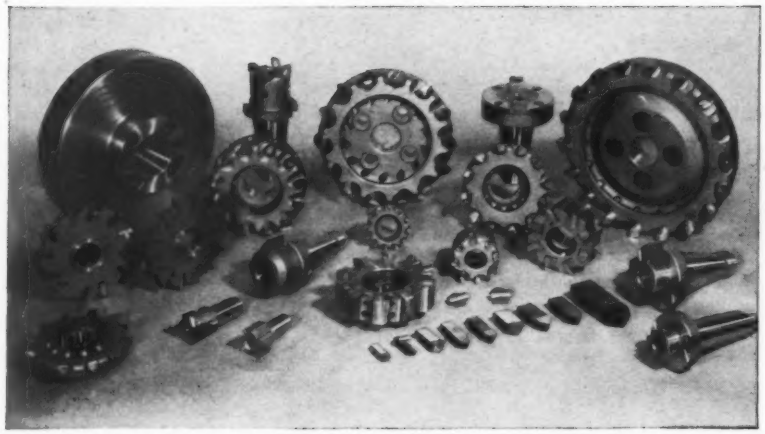


Milling Cutters — End Mills — Blades — Boring Tools —Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

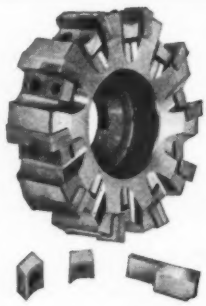
Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW "JOYDEX"

This performance-proved face mill features indexable blades for low cost-per-edge cutting. Exclusive design improvements include — adjustable anvils • extra deep chip flutes • fast, easy indexing • sweep blades for fine finish • double positive, or combination positive and negative rake angles merely by changing blades • rugged, one-piece body • large locking screws. *Try out a new "Joydex" and prove its superiority! ("Joydex" data sheet is yours for the asking).*



Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 106

. . . Men from Page 105

Garland W. Reese has been elected vice president, to serve in the executive department of the American Can Co.; **Robert B. Thompson** is now vice president of manufacturing, Canco Division; and **Leonard A. Britzke,** is general manager of manufacturing for the Canco Division.

Former plant manager of The Ramo-Wooldridge Corp. in Denver, **George W. Fenimore** has been made assistant vice president of the corporation. **I. A. Binder,** vice president of manufacturing, takes over as plant manager and senior company representative in Denver.

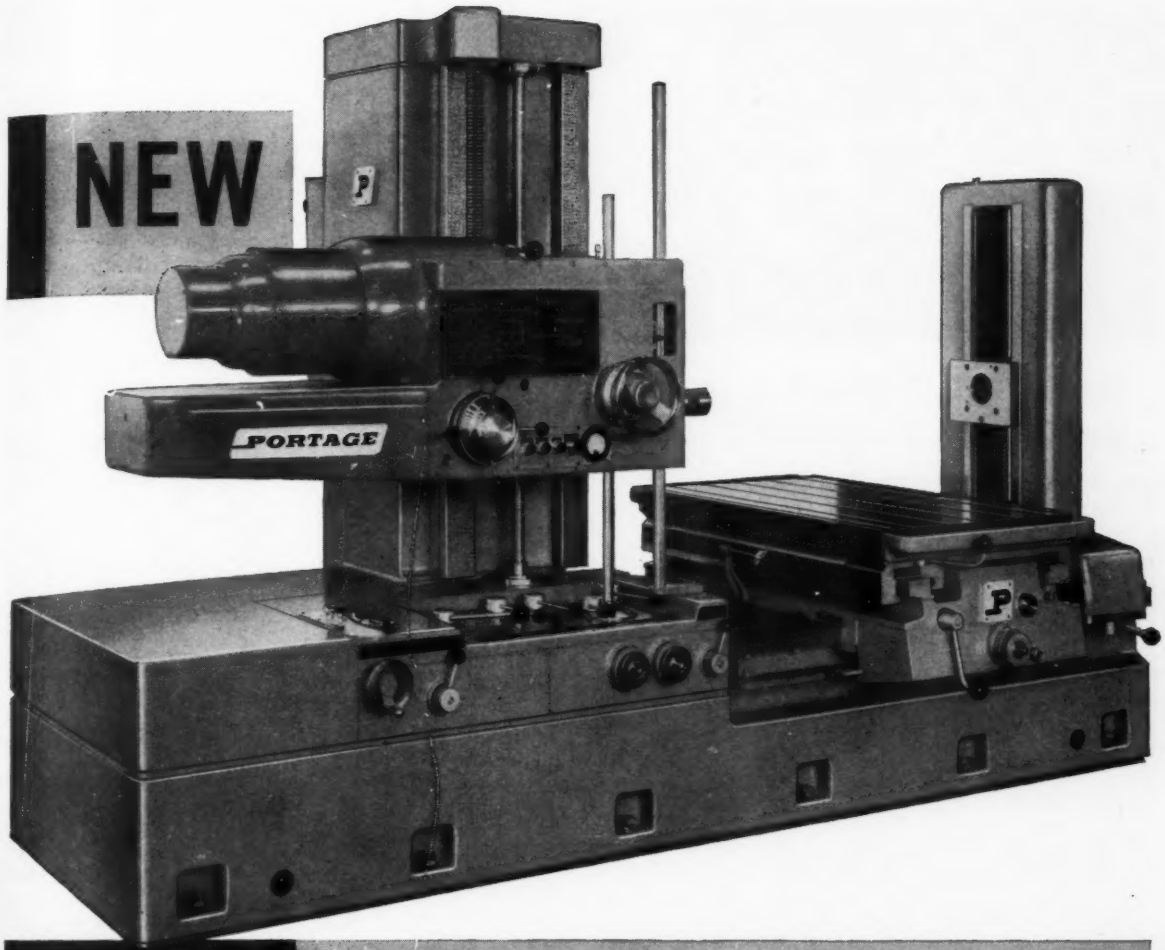
PRESSFEED LIFTABLE A ONE-MAN OPERATED SHEET HANDLER

The hand feeding of sheet steel into a shearing machine, long regarded as an operation for two or more men, has been reduced to a one man job through use of the Pressfeed Liftable. The system, now in effect at Colson's Elyria truck shop, has led to production savings of better than $4,000 by readjustment of personnel requirements.

A full load of sheet stock is placed on the Liftable, and the height is adjusted by the operator so that the table deck is always slightly above the shear table. The worker can then slide individual sheets of up to 3/16" x 30" x 120" into position for shearing, using a simple guide rail to keep sheets properly aligned.

Colson also has discovered that the danger of putting ruinous buckle marks in light gage larger sheets is minimized in the one man Liftable operation.

The Pressfeed Liftable, built by the Special Products Div'n of The Colson Corp., has a 10,000-lb capacity and is equipped with four independent hydraulic rams with cross-connected stabilizers to assure a level deck despite possible uneven loading. The Liftable is positioned by means of foot-operated "deadman" up and down pushbuttons. The 36" x 78" deck can be raised from 18" to 36".



PORTAGE...3" diameter horizontal milling, drilling and boring machine

Literature, just off the press, covers features and specifications.

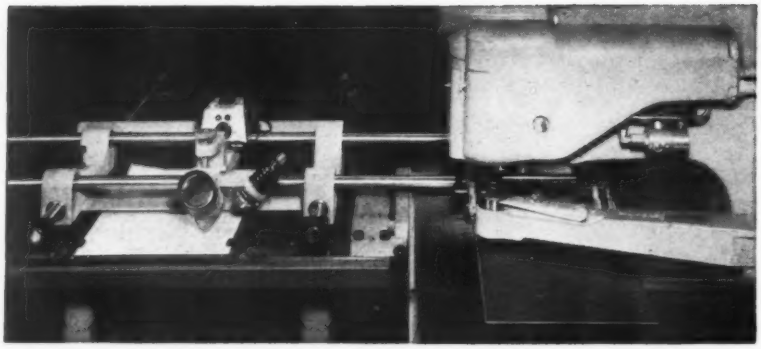
Mr. Buyer... here's a 3 inch bar machine you can't afford not to investigate. It's new from the top of the column to the bottom of the base... All new speeds and feeds, plus a versatility of job applications make it a real money maker. All new construction features offer a truly strong, rugged machine... and the pay-off... it's priced amazingly low, every shop can afford one ...write, wire or phone for complete information.

THE PORTAGE MACHINE COMPANY

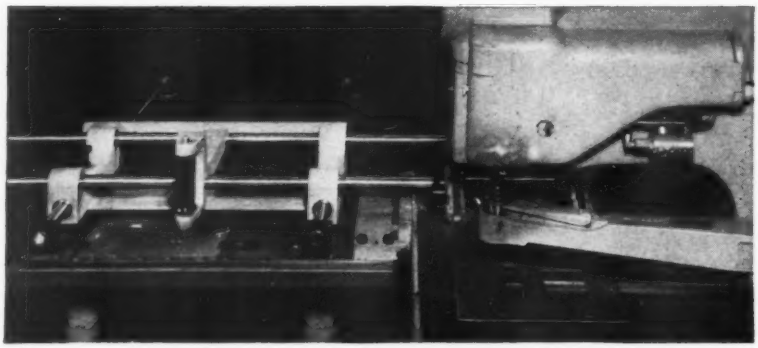
1036 SWEITZER AVE., AKRON 11, OHIO
PORTAGE 2-0211 TWX AK266

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

CIRCLE INFORM-A-GRAM KEY NO. 107



shortest distance
between blueprint and product



The DUPL-O-SCOPE

Firms punching or notching sheets up to ¼" mild steel in medium runs know how profitable it is with a Strippit Fabricator-Duplicator. Now, it's even faster with the new Dupl-O-Scope, which eliminates the template drilling and layout step!

Readily mounted in the Duplicator stylus bracket, this precision optical pickup device quickly translates a drawing, layout or printed circuit sample into a punched metal template — ready for rapid-fire punching and notching on the Fabricator-Duplicator using standard interchangeable tools or "specials" made up to your requirements.

Write today for catalog and an actual demonstration on *your* work at *your* plant by a Strippit Mobile Unit. Warehouse stocks at Chicago and Los Angeles.

The versatile Strippit Fabricator, one-machine shop for quick-change punching, notching and nibbling — available with positive Duplicator for high-speed production punching and notching in complex patterns including printed circuit boards.

WALES

STRIPPIT

Company

212 Buell Road, Akron, New York

In Canada: Strippit Tool & Machine Limited, Brampton, Ontario

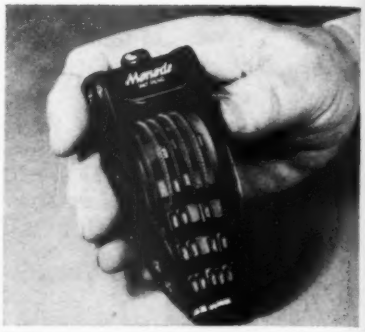
A UNIT OF HOUDAILLE INDUSTRIES, INC.

CIRCLE INFORM-A-GRAM KEY NO. 108

A NEW ELECTROLYTIC PARTS MARKER

An electrochemical marking method for applying identification data on piece parts has been developed and designed to permit quick change of numerals, letters, or symbols when required.

The Monode quick change consecutive marker developed by Monode, Inc., Cleveland 15, Ohio, is as simple to operate as a date stamp. Selecting the desired numbers or letters is accomplished by turning wheels that rotate bands containing individual Monode markers.



The method incorporates the use of a separate circuit in the power unit for electrolytic cleaning of stencil legend. The simplicity of design makes the marker easy and safe to operate. There are no metal working parts. This prevents galvanic deterioration of the unit and eliminates any malfunction due to corrosion.

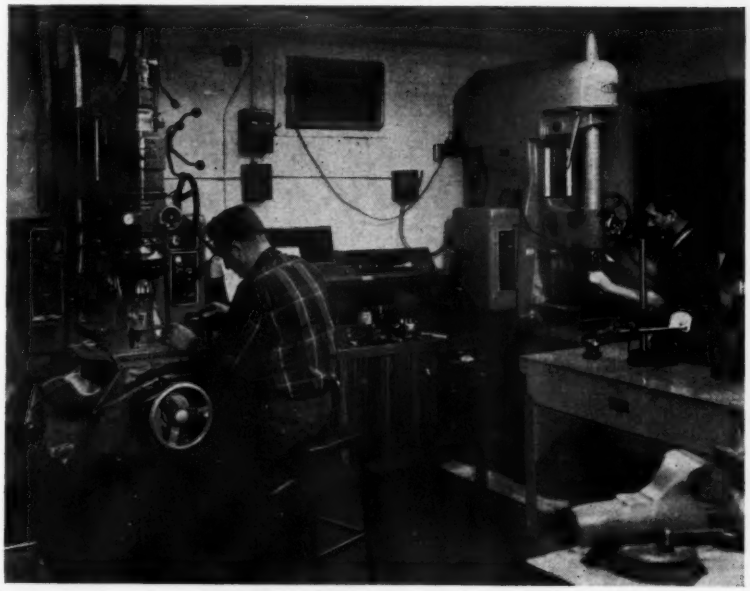
The non-metallic heads are easily and completely interchangeable and come in legend sizes of 1/16", 3/32", 1/8", 5/32", 3/16", and 1/4" in height. Individual characters (or the whole band) may be substituted or changed in seconds. Each band is precision cut with thirteen slots to receive the marking heads, and a plastic non-marking head contained in one slot of each band permits the neat marking of low numbers and separation of digits for code purposes. **Circle Inform-A-Gram No. D1.**

A revision of the American Standard B5.17, covering markings for identifying grinding wheels and other bonded abrasives, is now available. Designations for rubber reinforced and resinoid reinforced bonds are now included. Copies of the booklet can be purchased from American Standard Assoc., 70 E. 45th St., New York 17.

Ernest Olds tells how Moore Jig Borer and Jig Grinder Help "Broaden Our Scope of Precision"

This is another in a series featuring the views of leading tool and die companies

by **ERNEST E. OLDS,** General Sales Manager
Size Control Company, Chicago, Illinois
Manufacturers of gages and lapping machines



MOORE JIG GRINDER (left) and Moore Jig Borer team up in this dust-free temperature controlled room at Size Control Company. Under such conditions they have held hole location tolerances to .00005".

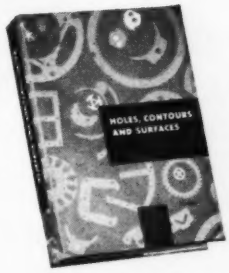
"We at Size Control Company find it absolutely necessary to broaden our scope of precision to meet the increasing needs of our customers. This calls for holding close limits on location as well as our usual tolerances on diameters.

"The Moore Jig Borer and Jig Grinder is our answer! In use, these machines give amazing, practical flexibility to establish extreme accuracy with repeated confidence.

"The Moore Jig Borers and Jig Grinders which we are now using are in a special temperature controlled room. They have held tolerances as close as .00005" with comparative ease. They are used in conjunction with electronic gages, which re-inspect the results of the Borer and Grinder and act as a double-check for accuracy."

In addition to maintaining close tolerances for tooling accuracy, Moore Jig Borers are designed for economical, high-precision production operations. Moore Jig Grinders prove their mettle in the finish-grinding of intricate contour shapes and holes. For literature describing the unique features of both these toolroom time- and cost-cutters, just write...

MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Connecticut



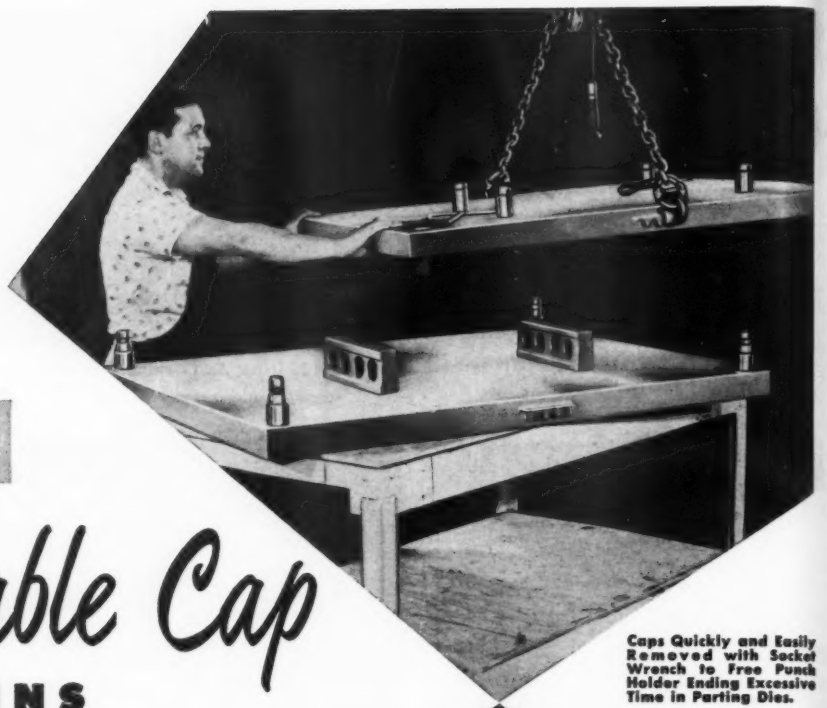
HOLES, CONTOURS AND SURFACES, Moore's authoritative book, tells how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U. S. A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 109

one man parts large die set in 3 minutes *with*



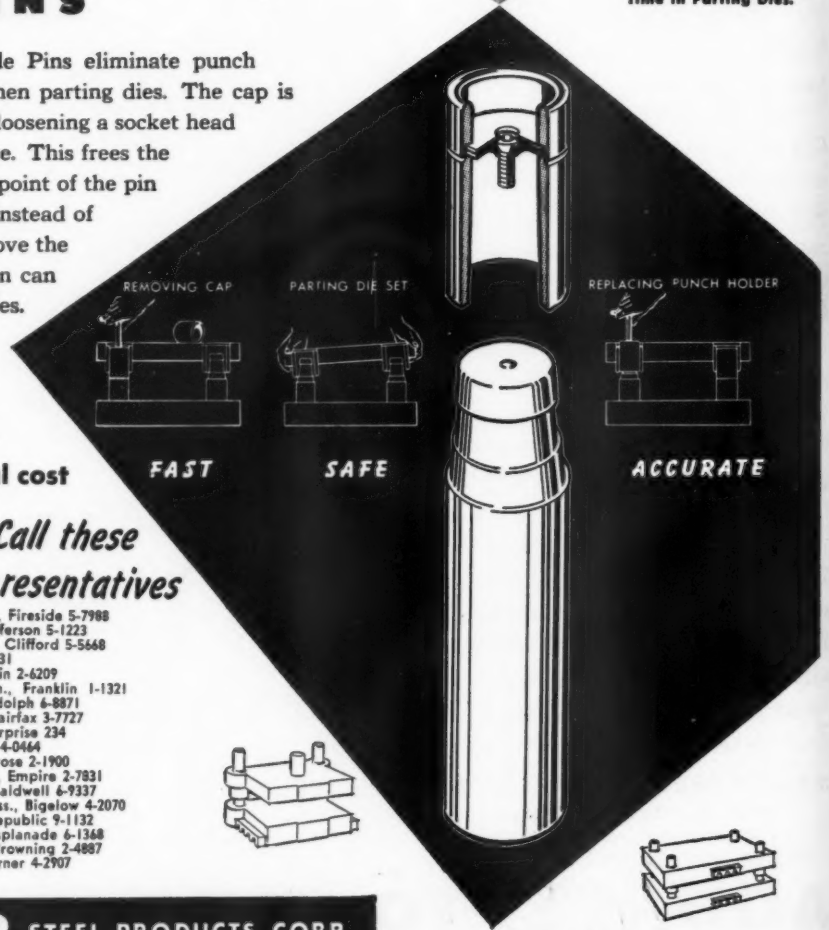
Caps Quickly and Easily Removed with Socket Wrench to Free Punch Holder Ending Excessive Time in Parting Dies.

SUPERIOR

Removable Cap

GUIDE PINS

Superior's Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind. Instead of needing 2 or 3 die makers to remove the punch holder from a set, one man can do this work alone in a few minutes.



NOW on every Superior die set in diameters from 1½" upward at no additional cost

For Fast Local Service Call these Expert Superior Representatives

2 PLANTS TO SERVE YOU

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Warwick, R. I., Turner 4-2907

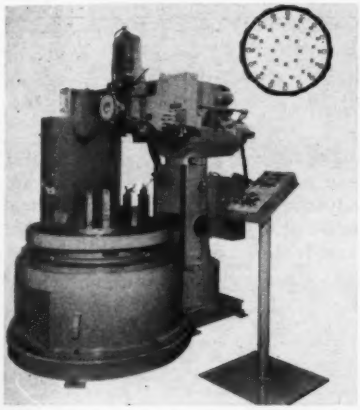
SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 110

RADIAL TURRET DRILL MADE FROM STANDARD COMPONENTS

This special Burgmaster radial turret drill is built up from standard Burgmaster components and a standard auto-indexing circular table. It is supplied as a complete manufacturing unit, including tools, fixtures, machine and hydraulic power, ready for production.

The machine is automatic in operation, arranged for center drilling, and drilling and tapping bolt circles having 8, 13 and 16 hole patterns. The bolt circles are of different diameters and at different levels on a dome shaped aluminum part. The radial slide is positioned for each bolt circle by a spring pin locator after which air clamps secure the slide rigidly in place. Selection of the hole pattern desired is done electrically from the master control station which controls all machine functions.



The hydraulically-controlled six-spindle turret is automatic similar to the standard Burgmaster Model 2BH turret drills built by Burg Tool & Manufacturing Company. It provides turret power indexing, preselected speeds for each turret face, preselective infinitely variable hydraulic feeds, accurate depth control for each turret face, and automatic rapid approach and return of each tool.

The machine has a drill capacity in mild steel of ¾" dia and ⅝" tapping capacity. It provides 12 spindle speeds from 225 to 3000 rpm.

The parts are held in simple locating fixtures that center on the rim of a machined surface and are clamped by simple toggle acting hand clamps.

BUY U.S. SAVINGS BONDS

Welding .008" diameter wire to a part the size of a fly's wing —3-D micro-vision makes precision possible.

Part to be welded shows up sharply under 13X magnification.

45X magnification and measuring reticle let inspector check winding tap-off gap to .5° (.001"). Potentiometer shown below, actual size . . . tap-off leads at top.

Why ACE ELECTRONICS calls B&L Stereomicroscopes "INDISPENSABLE for sub-miniature assembly"

Mounting a triangle this size to a shaft head this size with screws this size is just one phase of sub-miniature potentiometer production in the Somerville, Mass., plant of Ace Electronics Associates, Inc. Finished product is only ½" in diameter, ½" long, yet conforms to electrical characteristics of units four times its size. Precision specifications hold work to tolerances of .001". That's why Ace uses over 100 B&L Stereomicroscopes—for magnified, distortion-free views in natural 3-D aspect—in every stage of manufacture from assembly to measurement to inspection.

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TITLE.....
COMPANY.....
ADDRESS.....

CIRCLE INFORM-A-GRAM KEY NO. 111

Toolmakers' microscope reads to 0.0001" and 1 minute of arc. Co-ordinate range 4" x 2". Compact built-in rotary stage.

Make precise measurements to 0.0001" and cut rejects with Gaertner microscopes

Here are reliable, easy-to-use microscopes for precise, indisputable measurement of piece parts, tools, dies, thread gages, templates, jigs, fixtures, etc. With these instruments you make direct, non-destructive measurements — no contact, no distortion, images are sharp and clear.

Through the engineering facilities at our Chicago plant, these versatile, well-constructed microscopes can be adapted to meet your exact needs. Find out now how you can gain new production savings with Gaertner measuring microscopes.

Coordinate Measuring Microscope

High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".

Micrometer Slide Comparator

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

Scale Micrometer or Shop Microscope

High quality, low cost instrument with range up to 0.100". Reading to 0.001", easy interpolation to 0.0002".

Write for Bulletin 161-54

The Gaertner Scientific Corporation

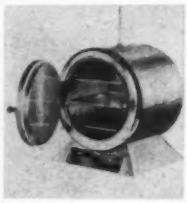
1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 1121

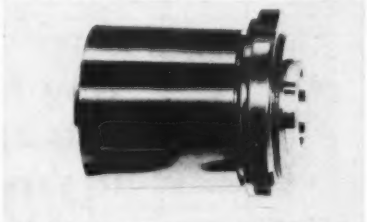
Products & Processes

PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS&PROCESSES

Uniform Heat throughout the working chamber is a feature of the Circ-O-Therm oven used for age hardening aluminum and magnesium alloys, soft soldering, and shrink fitting small gears. Temperatures up to 482°F are possible. Bulletin 458 can be obtained from Hevi-Duty Electric Co., Milwaukee 1, or — **A1.**

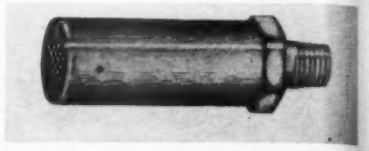


Increase Production 40% and cutter life 350% by using Sonnet roller bearings for milling machine outboard supports. They can be installed without machine rework and quickly moved from machine to machine. A bulletin is available from Sonnet Tool & Mfg. Co., 580 N. Prairie Ave., Hawthorne, Calif., or— **Circle Inform-A-Gram No. A2.**



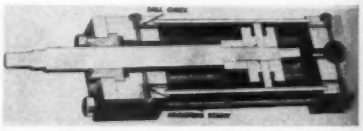
"Control Valves" is a 17-page catalog which gives brief descriptions of air control and valve arrangements and installations, illustrated with diagrams. Each valve is outlined with a list of specifications and several detailed views. Get your copy of Catalog 58 from Ross Operating Valve Co., 120 E. Goldengate Ave., Detrot 3, or — **Circle No. A3.**

Eliminate Objectionable Noises with the air mufflers introduced by Design Aids Co., 328 S. 6th St., Newark 3, N. J. Constructed from corrosion-resistant materials, the air mufflers are not affected by heavy concentrations of moisture or oil in pneumatic systems. Get information from the company, or — **No. A4.**



Simplify Production by selecting the proper type of seamless carbon steel mechanical tubing for your needs. A technical folder includes industry tolerance tables for cold drawn and hot-finished seamless carbon steel mechanical tubing. For Bulletin TB-418, write Tubular Products Div'n, The Babcock & Wilcox Co., Beaver Falls, Pa., or — **No. A5.**

Easier, Faster Cushion Adjustment and greater mounting versatility are advantages of the non-protruding, self-locking cushion adjusting screw now featured on all Miller cushioned air cylinders. The cylinder can even be mounted on the side containing the ball check or adjusting screw assembly. Miller Fluid Power Div'n, Flick-Reedy Corp., 2040 N. Hawthorne Ave., Melrose Park, Ill., or — **Circle Inform-A-Gram No. A6.**



This Lathe, designed for precision contour turning, boring, and facing of missile nose cones and other thin-walled and fabricated parts, has been developed by The Monarch Machine Tool Co., Sidney, Ohio. The Missile Master has 85" clearance diameter and 67" cross slide swing. For information, write the company, or — **Circle Inform-A-Gram No. A7.**

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Standard AIR GAGES

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JERGENS TOOL SPECIALTY CO.

Dept. TP-9 712 E. 163rd St., Cleveland 10, Ohio

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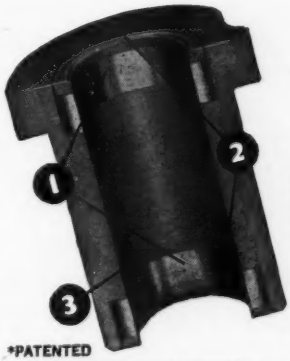
INCREASE PRODUCTION.. SAVE TIME & MONEY



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1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

For information and prices write for MEYCO Bushing Catalog No. 41

MEYCO

Carbide Inserted Bushings Are Doing It Daily!

How? Like this: (1) Last longer . . . with a life—in most cases—as long as solid carbide bushings at prices that approach the price of steel bushings; (2) Increased life for your drill jigs and fixtures; (3) Increased life for your drills and reamers; (4) Accuracy maintained for a LONG PERIOD of time; (5) Less non-productive machine time, less lost man-hours, because bushings need not be changed as often; (6) Inspection time saved, because of greater accuracy for a longer time; and (7) Less waste due to spoilage, for the same reason. Don't pass up a good bet! Get the dope on MEYCO Carbide Inserted Drill Jig Bushings today!

ESTABLISHED 1888

W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1133

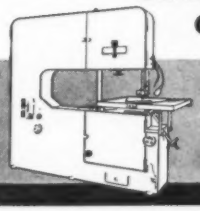
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE **TANNEWITZ WORKS**

GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
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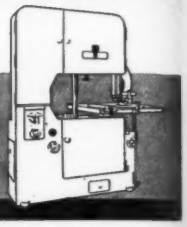
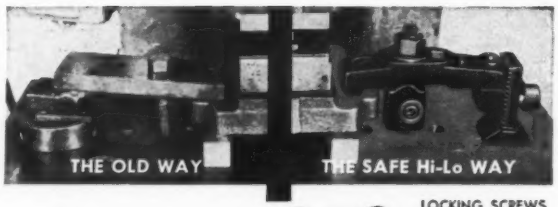
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



CIRCLE INFORM-A-GRAM KEY NO. 1141



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***self-contained... rapid adjustable* CLAMPS**

• Designed to overcome three major clamping problems . . . time consuming . . . bolt stripping waste . . . and unsafe set-ups. • All component parts stay integral—NO LOOSE PIECES • All parts are steel forging, heat treated for maximum toughness • Serrated bolt and step block adjustment design provides rigid, parallel clamping for safe set-ups

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Hi Lo **Hi-Lo PRODUCTS COMPANY**
Div. of Steel City Testing Machines, Inc.
8815 Lyndon Ave Detroit 38, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1142

How fast do you want to drill...

10,000 RPM MAYBE 15,000 OR 20,000 ?

Oil-circulating head with vertical adjustment spindles.

U. S. Drill Heads are designed to drill as fast as you need—*and still maintain accuracy!*

The rugged Fixed Center Head shown is a full ball bearing, oil-circulating model with built-in pump. It operates regularly in production at 15,000 rpm with very little heat! As in all U. S. Heads, shaved gears assure quiet, smooth operation—at all speeds. Write for catalog FC-57.

US DRILL HEAD

Adjustable and Fixed Center Multiple Drilling Heads. Individual Lead Screw Multiple Tapping Heads.

UNITED STATES DRILL HEAD CO

616 BURNS STREET • CINCINNATI 4, OHIO

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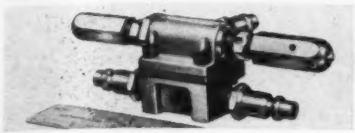
4-Way Midget Valves are used in tight spots and have controlling limit valves within easy reach. Model 420 can be remote-controlled by connecting the miniature limit valves



through ¼" plastic hose away from the main valve and tripping it by a working machine. For information, write Mead Specialties Co., Dept. MV-93, 4114 N. Knox Ave., Chicago 41, or — **Circle No. A8.**

Hi-Inertia Clutch-Brake Motors are discussed in a bulletin from Ferguson Machine Corp. of Indiana, 7818 Maplewood Industrial Court, St. Louis 17. Detailed diagrams and specifications are given for several types of motors, including those for light-duty machines and indexing machines with suddenly applied loads. Get your copy of Bulletin 700 from the company, or — **No. A9.**

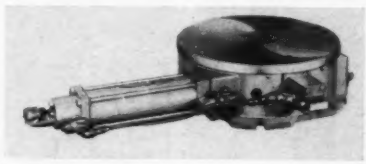
Flat-Top Hinged-Steel Belt Conveyor is for flush-with-floor and conventional above-floor mounting. It is suitable for warehousing and package handling applications. Machined

parts can also be moved on it because they cannot fall through the belt. May-Fran Engineering, Inc., 1726 Clarkstone Rd., Cleveland 12, or — **Circle Inform-A-Gram No. A10.**

Tool Crib Control speeds tool service, protects tool investment, and provides more production with less tools. The Victor indexing system is simple to use and gives an accurate record of the location of all tools. Write to Victor Adding Machine Co., McCaskey Industrial Div'n, 3900 N. Rockwell St., Chicago 18, for your copy of Bulletin 671-101, or — **A11.**

Protect Against Operator and Machine Damage by using Elasticone covers, spiral wound flat steel cones that spring-over exposed shafts, bushings, lead screws, etc. Dimensions are given for the covers in a technical data sheet and bulletin from Central Safety Equipment Co., 6601 Marsden St., Philadelphia 35, or—**Circle Inform-A-Gram No. A12.**

A Heavy-Duty 24"-Dia Air Index Table handles work loads up to one ton and sustains repetitive shock loads, both radially and axially.



When equipped for six-station operation, Model 2400 will index 30 positions/min. For information, write Air-Hydraulics, Inc., 676 Hupp Ave., Jackson, Mich., or — **Circle No. A13.**

A Retaining Ring Kit contains 376 cadmium plated Truarc internal, external, and universal crescent ring designs. Shaft sizes from ¼" to 2½" are included and the cadmium plating insures longer life. Bearings, Inc., 3634 Euclid Ave., Cleveland 15, or—**Circle Inform-A-Gram No. A14.**

Plastic Steel is one of the products described in a catalog from Devcon Corp., Danvers, Mass. Chemical and physical properties and applications of these products are given. For your copy of Bulletin NI-103, write to the company, or — **Circle No. A15.**

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With capacity of .004" to 5/16" in *all* drillable materials, and spindle speeds from 840 to 9300 R.P.M. infinitely variable in two speed ranges . . . *this* is the machine which the precision industries rely upon to handle the "heart-break jobs."

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ALSO . . .

Three companion drills, each built to the same accuracy but differing in drive, speed range, and clearances, to cover the full range of special precision requirements.

AND A TAPPER . . .

with capacity from .034" x 120 to ¼" x 24 . . . and a "reserve of accuracy."

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You will want full information about the Hamilton Line of precision drilling and tapping machines. And we will be glad to furnish it.

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($3490.00 with electric control circuit)

The BIG, NEW Hause... HOLOMATIC DOUBLE-END MACHINE

Hause Holomatic Double-End machines offer far more capacity, greater range and versatility, for all automatic spindle type operations. And... at a lower cost!

If you want the most for your equipment dollar, it will pay to compare the Hause Double-End machine with *any* comparable equipment. Because... Hause offers:

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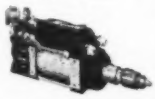
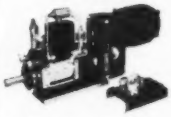
- Quick change of stroke, rapid travel length, feed rate, spindle speed and unit position.
- Greater capacity — handle parts up to 35" long.
- ⅝" drill capacity — mild steel.
- ¾" tapping capacity — mild steel.
- 4" maximum stroke.
- Adaptable to multiple spindle operation.
- Manual or automatic interlock cycle.
- Removeable coolant tank and pump.
- Can be used with index table, manual or air clamp fixture, hopper loader or automatic feed device.
- Available as basic machine, completely tooled or separate components.

These are but a few of the outstanding comparison features of the Hause Holomatic Double-End machine. Why not contact your nearby Hause representative. He will be glad to prove the efficiencies and economies of the Hause systems.

Model 24 — Holomatic Drill Unit Electric motor Driven Spindle


Model 14 — Holomatic Drill Unit Air Motor Driven Spindle

Model 24 — Holomatic Unit for Drilling and Tapping


Model 24 — Holomatic for Deep Hole Drilling

Holomatic Basic Machine: in any arrangement to suit many applications.

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DUSTKOP "520"
designed to collect dust from single machines

portable—easily installed

DUSTKOP STOPS DUST

Self-contained Dustkop models, like the "520," are practical and effective in collecting dust from single machines. They're designed specifically for service with surface grinders, tool and cutter grinders, offhand grinders, buffers and other small wheel equipment. These units are also easy to install — are actually portable — and very economical to operate.

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46 models to choose from!

NEW DUSTKOP AUTO SHAKER shakes filters AUTOMATICALLY

AGET manufacturing company
1394 E. Church Street, Adrian, Michigan
ask for details

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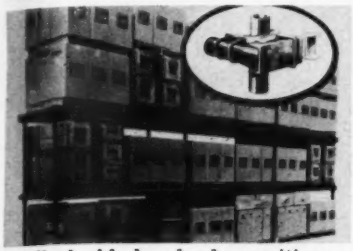
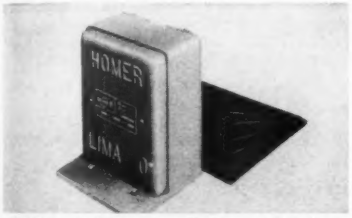
Construct Heavy-Duty, double- or triple-bay storage racks with the Beam-Strut clamp that can be used with either standard channel or I-beam and ordinary pipe. The racks



handle double-bay load capacities up to 20,000 lbs. For information, write Tube-Strut Corp., 2960 Marsh St., Los Angeles 39, or — **Circle No. A16.**

"Ultrasonic Cleaning" outlines practical applications and basic principles of this modern cleaning method. Batch immersion, conveyor and multi-stage systems, and transducer arrangements are discussed, in addition to several methods of evaluating performance. Get your copy from Branson Ultrasonic Corp., 40 Brown House Rd., Stamford, Conn., or —
Circle Inform-A-Gram No. A17.

Fast Handling of Sheet Metal is possible with the Homer Magnetic sheet separators. All three new sizes are available with Amalloy frames

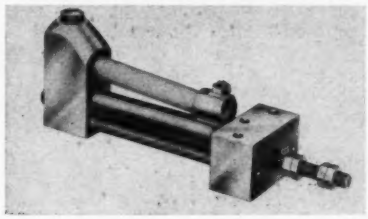


which cut down cracking or fracturing of the sheet separator. For more information, write Homer Mfg. Div'n, The Ohio Electric Mfg. Co., Dept. 382, Lima, Ohio, or — **Circle No. A18.**

"Simplify Tool Crib Operations" describes the system built around Kolect-A-Matic files. A record is kept of the tool being used and by whom; the worker keeps a receipt to be returned with the tool. For Folder KD-844, write Remington Rand Div'n, Sperry Rand Corp., 315 4th Ave., New York 10, or —
Circle Inform-A-Gram No. A19.

"Portable Power Tools," a 48-page catalog, contains descriptions and specifications on balancers, bench grinders, drills, hammers, impact wrenches, nibblers, etc. Obtain your copy of Catalog 85 from Thor Power Tool Co., Prudential Plaza, Chicago 1, or — **Circle No. A20.**

A Hydraulic Feed Control for use in controlling air cylinder piston rods and reciprocating action, prevents chatter or shock and provides uniform power feed. The Stedifeed features an oil-filled checking cyl-



inder, adjustable metering valve, and reservoir. Burklyn Co., 3429 Glendale Blvd., Los Angeles, Calif., or—**Circle Inform-A-Gram No. A21.**

Recover 99½% of your recoverable cutting oil and reduce oil costs 80% to 90% using centrifugal oil extractors, discussed in a bulletin. It includes information on centrifugal extracting, extractor specifications, efficiency charts, and facts about reclaiming cutting oil. Write The Leon J. Barrett Co., P. O. Box 378, Worcester, Mass., or — **Circle No. A22.**

5603

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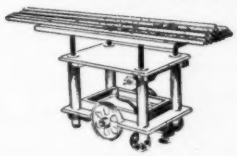
NEW *Convenience*
NEW *Capacities*
NEW *Designs*

PORTELVATOR®

The Handy HAMILTON Portable, Elevating Table



NEW provision for increasing table area!

NEW provision for raising and lowering overhanging loads!

NEW convenience in maneuvering! Six wheel models roll easier . . . turn shorter.

NEW overhanging conveyor tops!

More stamina, more versatile performance than ever before

NEW FREE LITERATURE illustrates and describes all! Write for Bulletin P-5603. Address, The Hamilton Tool Company, 832 South Ninth Street, Hamilton, Ohio.

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DPS *has*

the technical know-how to "*engineer*" more speed and profit into your assembling operations.

● The signal success of DPS trained engineers in adapting power equipment to the individual feeding and assembling needs of industrial plants everywhere is assurance that they can likewise solve your special problems. In our broad line of

SELECTIVE PARTS FEEDERS
POWER SCREWDRIVERS
SPECIAL ASSEMBLING MACHINES

equipment can be selected, and custom features incorporated, to fit your requirements. Plan now to use DPS modern assembling methods. Tell us your set-up. Write for catalog and further details.

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Electrical vibratory type to feed parts that cannot be tumbled.

POWER SCREWDRIVERS
An extensive, versatile line in both bench and pedestal types.

BARREL FEEDER
Popular motorized type, for parts requiring critical selection.

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1. Unlimited life within borders of permissible loads.
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4. Exact adjustment to the desired pressure.
5. Small construction height, large deflection.
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7. Large impact damping especially with multiple stacking.
8. Excellent space disposition.
9. Spring pressure, Spring length and Spring deflection can be easily determined for the same Spring size or can be changed by lengthening or shortening of the Spring columns or by multiple stacking. In special cases the character line can be made to divert from its usual straight form by diversified stacking.
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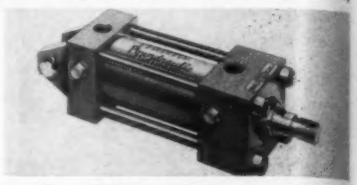
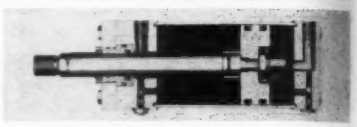
The Powrdraulic Hydraulic Cylinder Line features a pressure tightening tube seal which remains tight at all pressures. These cylinders,



rated at 2000 to 3000 psi non-shock, range in bore sizes from 1½" through 8". Literature is available from Hanna Engineering Works, 1765 Elston Ave., Chicago 22, or — **No. A22.**

A Line of Cylinders for air and low-pressure hydraulic applications is available in 11 bore sizes. Series R2 is rated at 200 psi air, and 500 to



2500 psi hydraulic depending on bore size and application. Hydro-Line Mfg. Co., 5600 Pike Rd., Rockford, Ill., or — **Circle No. A24.**

A Fine-Finished Steel for applications that do not require heat treatment other than case hardening is Royal precision-ground low-carbon steel. It offers easy machinability, good weldability, 35 microinch or finer finish, and is available in a range of sizes from Vanadium-Alloys Steel Co., Latrobe, Pa., or — **No. A25.**

Tools for Drill Presses, surface grinders, lathes, milling machines, and inspection are described in a catalog. Specifications for all models are given along with illustrations. Get Catalog 58-A from Montgomery & Co., Inc., 7 Tichenor Lane, Newark 2, N. J., or — **Circle No. A26.**

Tube-Veyor, an enclosed material handling conveyor featuring a two-directional chain, is discussed in a bulletin. It handles any free-flow materials such as chips and sludge, at high temperatures. Get a copy from Prab Conveyors, Inc., 30121 Groesbeck Hwy., Roseville, Mich., or—**Circle Inform-A-Gram No. A27.**

Couplings for high and low pressure applications, impact in air lines, vacuum and very low pressures, and hard to handle fluids, are described in a catalog. Construction details, dimensions, and dimensional drawings are included. Get this catalog from Snap-Tite, Inc., Union City, Pa., or—**Circle Inform-A-Gram No. A28.**

ANCHOR BUSHING DRILL TEMPLATES HOLD DOWN TOOLING COSTS ON THE *Ag-2*

Manufacturing costs are closely watched on Transland Company's new, production designed Ag-2 agricultural and forestry airplane.

Inexpensive, lightweight, Anchor Bushing drill templates provide low cost drill tooling for the complete interchangeability of parts for production and spares for the Ag-2's service program.

Photo shows an easy-to-make Anchor Bushing drill template being used to locate and drill holes for Blind Nuts in the six fuel and liquid wing tank bays and matching holes in interchangeable tank covers.

Write for the Anchor Bushing Catalog for descriptions of Anchor Bushings and shop proven methods for making low cost sheet metal and plastic drill tooling.

STANDARD TYPE FOR SHEET METAL TEMPLATES

CIRCLE TYPE FOR LAMINATE PLASTIC TEMPLATES

U. S. PATENT 2483686
FOREIGN PATENTS PENDING
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hi-shear RIVET TOOL COMPANY
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COMPLETE VALVE CATALOG Ready!

MEADMATIC

4-way pilot-operated air valve for direct or remote control—no delicate electrical hookup needed.

A light momentary touch on limit switch actuates main valve piston—response is instantaneous! Catalog free.

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PATHFINDER IN AIR POWER AUTOMATION

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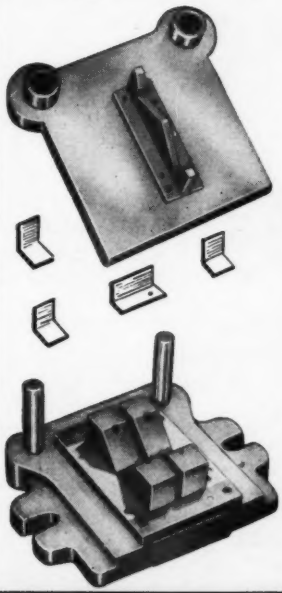
Punches and Dies

Angle Iron Cut Off Die



No. 18, cut off die, for 2" x 2" x ¼" and lighter angles. Mounted in leader pin die set. Fits most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adaptors and die shoes to convert your press. Each precision-made.

26 *years of serving your punch and die requirements*

What are your punch and die needs? Consult us about your problems. Prompt service on "specials" made to your order.

SEND FOR FREE CATALOG NO. 157 AF, illustrating our standard punches and dies and complete line of modern sheet metal fabricating equipment. **NET PRICES SHOWN.**

WARD Machinery Co. 564 West Washington **Chicago 6**

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Full 1/3 h.p. G. E. Motor

VERTICAL

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complete with cord, plug, switch ready to use $89.95

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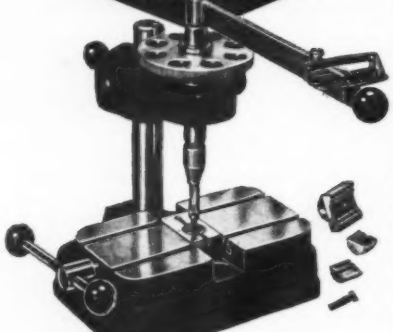
STURTEVANT TORQUE TESTING FIXTURE



FOR TESTING Screws, thread-cutting and thread-forming screws—all types of threaded fasteners; threaded parts and threaded connections.

FOR MANUFACTURERS
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TOOL ENGINEERS
LABORATORIES and for
PRODUCT CONTROL
in assembly.

Capacities: (0-200 in. lbs.) or (0-150 ft. lbs.)

Write for Bulletin TTF

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Machining

PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS

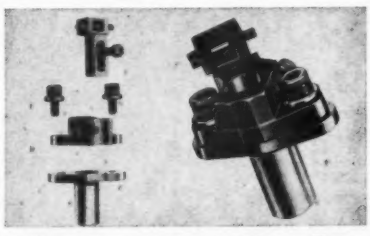
A Speed Chart for screw machine stock is offered by the Aluminum Company of America, Pittsburgh 19, Pa. The recommended surface speeds — given for round, hexagon, and square stock — can be converted

into rmp by setting the known work diameter. The chart also lists the nominal composition of several screw machine stock alloys to help users determine conditions for machining this metal. Get your chart from the company, or — **Circle No. A29.**

Almost any Ferrous or nonferrous metal can be cut by this small, heavy-duty, dry-abrasive cutting machine. The Sever-All, Model 1-A, gives high quality cuts at a rate of 3 to 6 sec/sq in. Allison-Campbell Div'n, American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn., or — **Circle No. A30.**

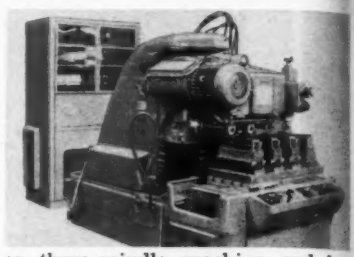
The Simplimatic Automatic Lathe is completely discussed in a 20-page catalog which lists specifications, describes lathe features and attachments, and gives a number of applications. Diagrams of suggested floor plans for lathe installation are also included. Obtain Catalog 1159-C from Gisholt Machine Co., Madison 10, Wis., or — **Circle No. A31.**

A Combination Drill and Turning Toolholder can be used to add a light turning or facing operation when the turret is full, and to provide a chamfer or sizing turn combined with a



drilling or reaming operation. Three sizes are available. For information, write The American Cam Co., Inc., P. O. Box 2106, Hartford, Conn., or— **Circle Inform-A-Gram No. A32.**

An Automatic Hydrocopy Blade Milling Machine mills jet engine, gas, and steam turbine blades to 18" in length of blade section. The Rigid ST-100 is available as a two-



or three-spindle machine and has working accuracy of ±0.002" with good finish. Cosa Corp., 405 Lexington Ave., New York, or — **No. A33.**

A New Accessory permits mounting a 20" drill head on an overhead tract to drill panels, sheets, plates, or large work; to handle work that's difficult to move; or to drill a number of holes without moving the work. With such a setup the spindle

can be positioned anywhere within 10" of either side of the length of the track. The ¾" dia column is 33" long and moves easily. Delta Power Tool Div'n, Rockwell Mfg. Co., 490 N. Lexington Ave., Pittsburgh 8, or — **Circle No. A34.**

A New Cam-Operated Indexing Unit for precision positioning between automatic production stations features a higher torque rating with increased shaft diameter. It operates with index shaft vertical or

horizontal, and indexes of 8, 12, 16, or 20 can be obtained during one turret cycle. The Standard Tool & Mfg. Co., 237 Laurel Ave., Kearney, N. J., or—**Circle Inform-A-Gram No. A35.**

AT LAST — DURABLE, SIMPLE
QUICK TO INSTALL
DIE STOPS!

Automatic Stop

Cut-Off Stop

Ruggedly constructed for long dependable service, KEYSTONE STOPS are *simple to install*. In fact, an apprentice can install any of them within 15 minutes. Designed by a die maker to solve time consuming die stop problems, they have been brutally tested and prove to be the finest stops available.

See for yourself. Discover that you can combine quick installation with extra long wear!

Write for full information and the name of your nearest Keystone distributor.

Retractable Spring Stop

Primary Stop

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KNURLED HEAD SCREWS
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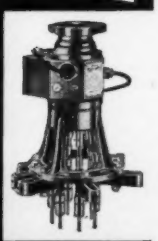
★ AUTOMATIC TAP REVERSAL
★ FITS ANY DRILL PRESS
★ PRECISE DEPTH CONTROL

MULTI-TAPPER simultaneously handles different tap sizes and pitches—can be set up for automatic or semi-automatic operation. Makes any drill press a production tapping tool.

Want a demonstration in your plant? Write us and we'll arrange it with your nearby Commander Distributor. Ask for your copy of the new Commander Production Tool Catalog.



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HYDRAULIC
KEYSEATER
cuts standard, tapered keyways ¼" to 2" wide

- fast set-up—saves time and money
- low cost operation-uses standard tool bits
- heavy-duty hydraulic circuit—assures accurate keyways
- compact, 21" x 61"—no special foundation

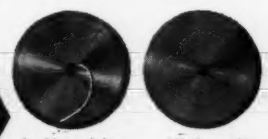
Send for Bulletin 34

E. W. BLISS COMPANY
1132 N. Seventh St., San Jose, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1214

NOW GET CLEAN SURFACED PARTS FROM YOUR AUTOMATICS ... UNMARRED BY TOOL WITHDRAWAL MARKS

THE NEW RELIEVOMATIC
SELF-RELIEVING TOOL HOLDER
SAVES YOU COSTLY SECONDARY FINISHING OPERATIONS


Avoid scratches like this.

All clear with "Relievomatic!"

Easily installed on cross-slide or turret

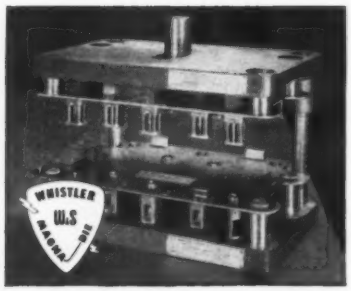
Write today for details.

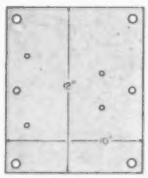
SILBER PRODUCTS, INC. Nightingale 9-8600
870 Essex Street • Brooklyn 8, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1215

OVER $2500 SAVED

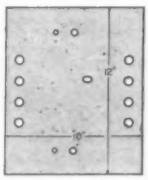
on 4 stamping jobs with WHISTLER MAGNA-DIES





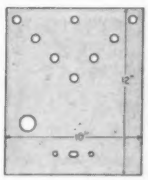
1

Custom Die $825*
Orig. Magna-Die ... 819
SAVINGS $106



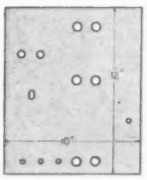
2

Custom Die..... $1100*
Magna-Die Parts. 390
SAVINGS..... $710



3

Custom Die..... $1040*
Magna-Die Parts. 247
SAVINGS..... $793



4

Custom Die..... $1089*
Magna-Die Parts. 164
SAVINGS..... $925

*Custom Die prices estimated

...continued savings with each succeeding job!

GET COMPLETE DETAILS BY WRITING FOR CATALOG M-1955

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748 MILITARY ROAD, BUFFALO 23, N. Y.

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Representatives in Major Cities

S. B. WHISTLER & SONS, INC. • 748 Military Rd., Buffalo 23, N. Y.

Mail your illustrated Magna-Die Catalog M-1955 to us at once.

NAME _____ TITLE _____

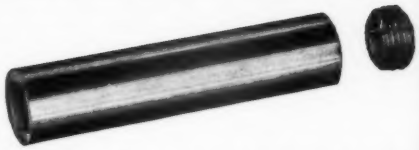
COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 1221

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!



One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.

The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
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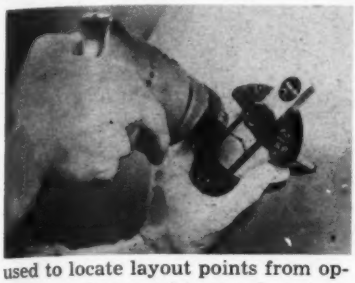
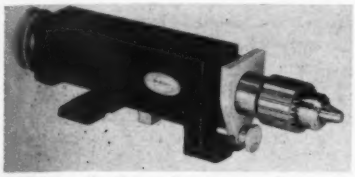
A New Tool "sees" through metal and helps operators locate hidden parts and drill blind holes. A sensing tube in the Blindriller is drawn by a magnet in a hole to the opposite side of the metal. It can also be



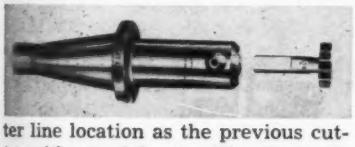
used to locate layout points from opposite surfaces and to speed up template reproduction. For information, write Zephyr Mfg. Co., Inc., 201 Hindry Ave., Inglewood, Calif., or — **Circle Inform-A-Gram No. A36.**

For Machining Light-Gauge Steel and non-ferrous metals in tight spots, use Model 22A drill head. The small drill head can be mounted in any



position, singly or in groups for synchronous operation, and will drill, tap, ream, spot face, countersink, and counterbore. The Bellows Co., Akron 9, Ohio, or — **Circle No. A37.**

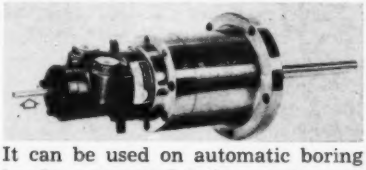
One Minute Cutter Changes and reduction of machine downtime and setup scrap are advantages of the Quick-Change Woodruff keyseat cutter. This tool cuts on the same cen-



ter line location as the previous cutter without trial cuts. They're available in straight- or stagger-tooth designs. Quality Tool Works, 760 S. Market St., Waukegan, Ill., or — **Circle Inform-A-Gram No. A38.**

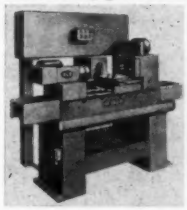
An Electro-Hydraulic Die-Closing Rotary Swaging Machine is designed to make reductions in diameter on rods and heavy tubes which cannot be reduced by feeding into standard rotary swaging machines. A brochure gives construction features, applications, and a detailed diagram of the machine. Get a copy from Swaging Machine Div'n, The Torrington Co., Torrington, Conn., or — **Circle Inform-A-Gram No. A39.**

A New Actuator/Indicator Rod Extension on the Model RC rotating cylinders is designed to actuate limit switches and similar control devices in conjunction with cylinder operations or to indicate piston position.



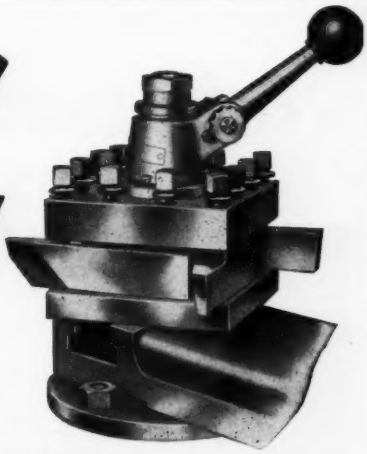
It can be used on automatic boring heads, automated lathes, and screw machines. The S-P Mfg. Corp., 30201 Aurora Rd., Solon, Ohio, or — **A40.**

New Precision Boring Machines, Models 712 (below) and 711, economically produce very small bores. By using a special multi-boring plate, accurate holes held to close center distances, previously bored one at a time, now are bored in one pass on a high-production basis. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or — **No. A41.**



Cut Costs!

McCROSKY Turret TOOL POSTS



permit successive tools to be swung into position quickly indexed accurately and locked rigidly

Endorsed by All Well Known Lathe Manufacturers

Multiple tool jobs become continuous when you use McCrosky Turret Tool Posts. They permit engine lathes to handle — efficiently and economically — a wide variety of work that otherwise would require a turret lathe or specialized machine. Ruggedly built. 12 indexing positions. Mount in the T-slot of the compound rest or bolt circle of the main slide. Unsurpassed for performance and satisfaction. Write for a fully descriptive catalog today!

The complete McCrosky line includes:

Jack-Lock® Milling Cutters — Wizard® Quick-Change Chucks
Super® Adjustable Reamers — Block Type Boring Bars
Turret Tool Posts — Specially Engineered Multiple Operation Tools

Fully descriptive catalogs sent promptly on request. Write for yours today!

COST CUTTING TOOLS McCROSKY TOOL CORPORATION MEADVILLE, PA.

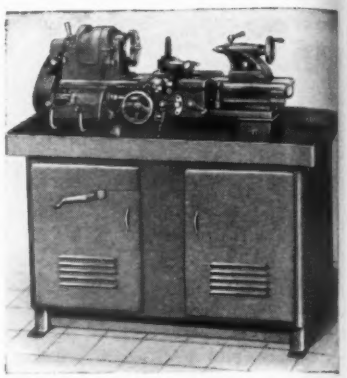
Engineering and Sales Representatives in the Principal Cities

CIRCLE INFORM-A-GRAM KEY NO. 123

A Metal Cutting Band Saw can be used as an upright band saw or for horizontal cut-off work. Horizontally the Model 58-B will handle rounds up to 6", rectangular shapes up to 6" x 10" and 5" x 5" at 45°. To convert it to an upright saw, simply swing the head to a vertical position and install worktable. Wells Mfg. Corp., 1940 Cedar St., Three Rivers, Mich., or—**Circle Inform-A-Gram No. A42.**

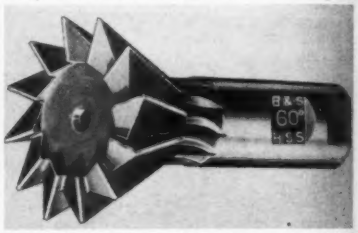
For Treatment and Protection against rancid cutting fluids, use the bactericide described in a brochure. Cimcool Bactericide "00" wafers, added to the coolant, help eliminate odors and are cheaper than replacing the whole coolant supply every few days. Cincinnati Milling Products Div'n, Cincinnati Milling Machine Co., Cincinnati 9, or — **No. A43.**

Greater Accuracy, Durability, and convenience are features of the improved line of 10" swing precision lathes produced by South Bend



Lathe, South Bend 22, Ind. Both bench and floor models are made in several bed lengths and supplied with either engine lathe or toolroom lathe equipment. For information, write the company, or — **No. A44.**

General Milling of Angles and dove tails can be accomplished with the series of 60° shank-type angular cutters introduced by the Cutting Tool Div'n, Brown & Sharpe Mfg. Co., Providence 1, R. I. They're

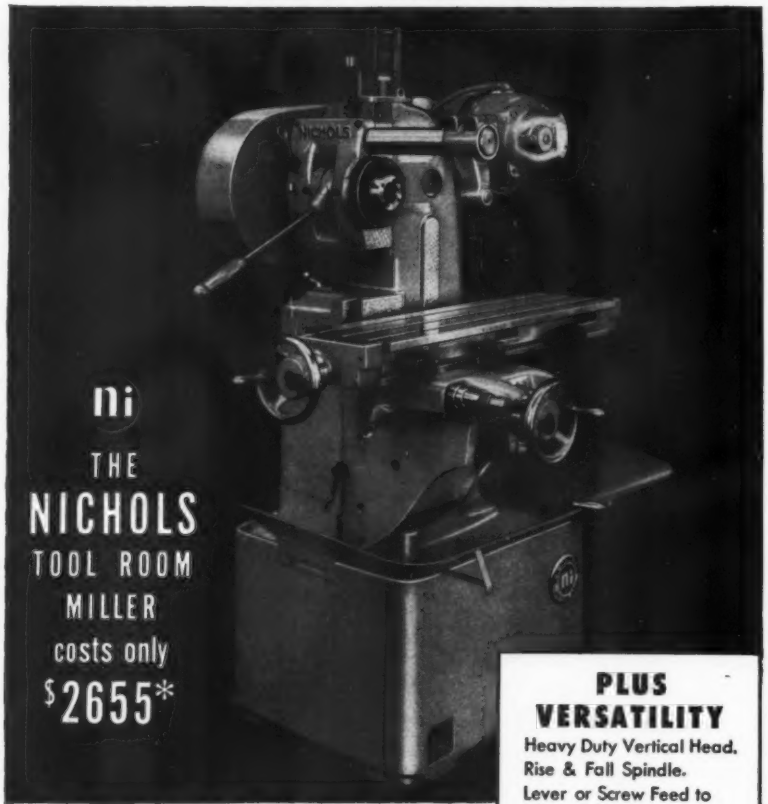


available in ¾", 1⅜", 1⅞", and 2¼", and can be used where arbor-type cutters interfere with the workpiece. Bulletin C-24 is available from the company, or — **Circle No. A45.**

Fully Optical 12" and 16" Rotary and Inclinable Tables feature photoedged lines in conjunction with optical wedge prisms. These tables, manufactured by Optical Measuring Tools Ltd., England, are free from de-

flection even with heavy loads, because when a clamp is depressed, it straddles a number of lapped pins inserted in reamed bolts in the worm wheel. Bentley Industrial Corp., 41 E. 42nd St., New York 17, or — **Circle Inform-A-Gram No. A46.**

a COMPANION in ACCURACY for YOUR JIG BORER



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PLUS VERSATILITY

Heavy Duty Vertical Head.
Rise & Fall Spindle.
Lever or Screw Feed to table.
Full line of accessories.
Ask for brochure "The Millers that use their Heads". Free-loan educational films available.

*FOB Waltham, Mass., complete with 1 HP motor drive and standard equipment.

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The ROBERT E. MORRIS Company

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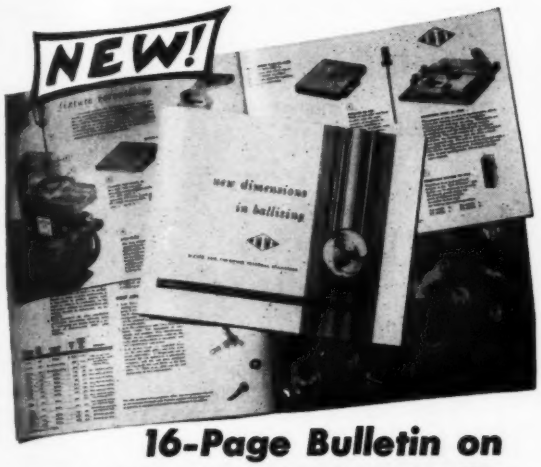

16-Page Bulletin on

BALLIZING

. . for fast, accurate, low-cost hole sizing and finishing. Describes the process and its advantages — gives working data — tells savings obtained on wide variety of jobs — shows new ballizing equipment, including universal fixture.

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MANUFACTURERS OF PRECISION BALLS AND BEARINGS
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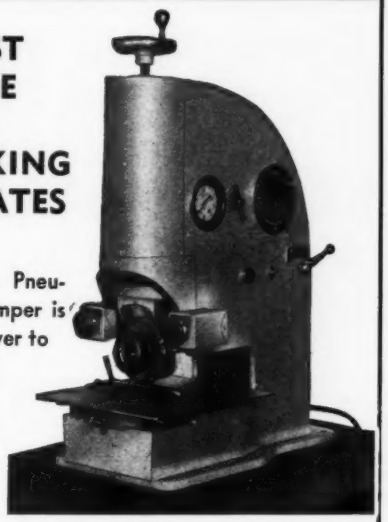
THE MOST EFFECTIVE METHOD OF MARKING NAMEPLATES



The new GTS Pneumatic Plate Stamper is the modern answer to clean, accurate plate marking.

This GTS designed and built machine guarantees that your plates will be marked with precision in alignment, spacing and depth of characters. The fatigue of hand stamping is eliminated.

For speed, safety, economy and power, GTS has all the answers to your plate marking problems.

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Are you STUMPED FOR THE RIGHT TOGGLE CLAMP?...

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It's 100 to 1 you'll find the answer among 120 standard DE-STA-CO Toggle Clamps and scores of spindle accessories.

Even more! Our engineers will give you suggestions if you send a print or rough sketch.

And there's a DE-STA-CO Stocking Distributor nearby.

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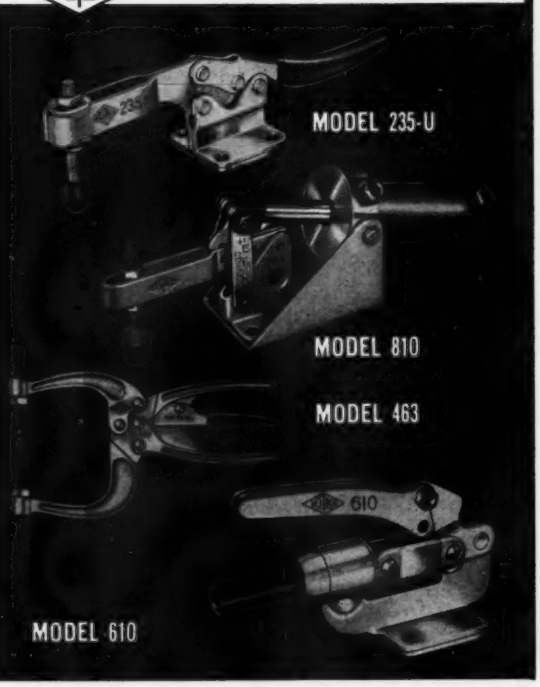
DE-STA-CO 4 TYPICAL CLAMPS



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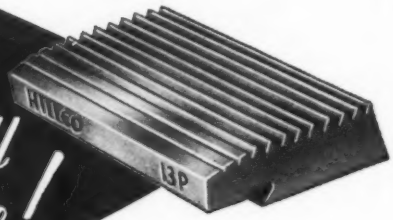
"HILLCO" TANGENT CHASERS

We think you'll agree!



The new line of "HILLCO" Tangent Chasers, which can be re-ground for 80% of their original length, are guaranteed to be of highest grade tool steels ground to exacting tolerances. We feel that this complete line of chasers are the finest that we have produced in our 75 years of cutting tool manufacture. We think that you will agree with us.

THE HILL ACME COMPANY
ACME MACHINERY DIVISION
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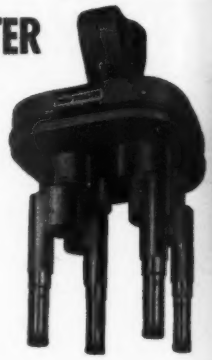
CIRCLE INFORM-A-GRAM KEY NO. 1261

Buy **THRIFTMASTER**

Double Eccentric Adjustable

DRILLHEADS



The only heads of this type standard with

Full Ball Bearing Construction

- greatest flexibility in drilling irregularly spaced holes
- sustained accuracy for trouble-free operation
- 20 Standard Models—3 to 8 Spindles
- Special Models on Order

Makers of DORMAN AUTOMATIC REVERSE TAPPERS

Write today for complete information on this *dependable* Double Eccentric Adjustable Drillhead . . . the latest addition to the Thriftmaster line of Single Eccentric Universal Joint Type Adjustable and Special Fixed Center Drillheads.

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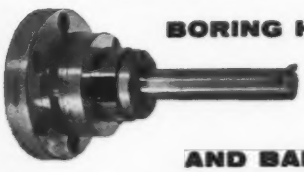
CIRCLE INFORM-A-GRAM KEY NO. 1263

DEKA BORE

BORING HEADS



AND BARS

UNPARALLED

- Accuracy
- Simplicity
- Rigidity
- Durability

. . . for all precision boring machines.

REPEAT TO .0001" IN 30 SECONDS WITHOUT BACKLASH!

100% GUARANTEED! WRITE FOR CATALOG!

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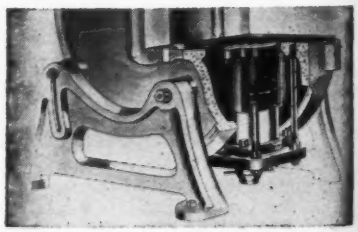
Offer 4-Point SUPERIORITY Over Springs, Rubber Bumpers

1 Adjustable compression provides ideal blank holding pressure.

2 Bronze bearing surfaces give maximum stability.

3 Constant pressure assures equal loading at start and finish of draw.



Full Universal Pneumatic Die Cushion

4 Simple mounting, either bolster or press bed. More stable installation possible due to method of suspension.

Write For Catalog F-44-A

DAYTON ROGERS *Manufacturing Company*

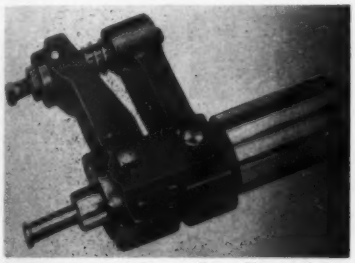
MINNEAPOLIS 7B, MINNESOTA
CIRCLE INFORM-A-GRAM KEY NO. 1264

Rollover Threading of Small Parts, rather than single-side "bump" rolling, is now possible with the Model 250 Precision-Rol thread rolling at-

tachment. It rolls threads up to ¼" OD and from 20 to 80 tpi and is used with Model 00 Brown & Sharpe automatic screw machines. The Sheffield Corp., Dayton, Ohio, or — **Circle Inform-A-Gram No. A47.**

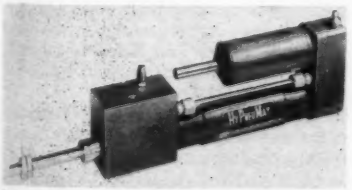
An Extreme Pressure Lubricant, Molylube 110-L, provides a tough film that withstands shock loads and wiping action, and helps prevent rusting. It can be used on high speed spindles, bearings, threads, and sliding machine parts to prevent seizing and galling. Bel-Ray Co., Inc., Green Village Rd., Madison, N. J., or — **Circle No. A48.**

For Internal Chamfering on automatic screw machines, get the recessing toolholder announced by Boyar-Schultz Corp., 2000 S. 25th Ave., Broadview, Ill. When mounted



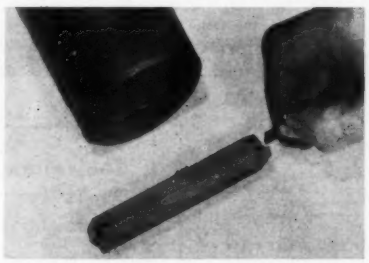
in the turret, it's easily adjusted for positioning the point of the recessing tool bit. They're available in No. 00, No. 0, and No. 2 sizes. Write to the company for more information, or — **Circle Inform-A-Gram No. A49.**

Provide an External Hydraulic Feed Rate to various tools or cylinders with the Model HB-125 Hypneumat Hydra-Brake. This check-



ing cylinder has stroke lengths of 3½" to 12", with a checking load of 1200 lbs. Hypneumat, Inc., 647 W. Virginia St., Milwaukee 4, or — **Circle Inform-A-Gram No. A50.**

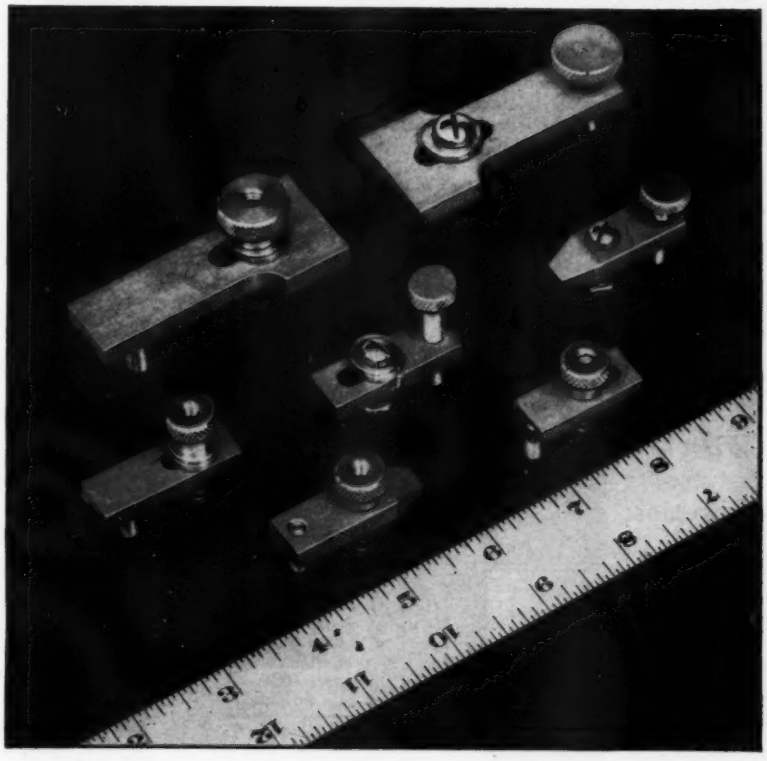
Throw-Away Carbide Tips, indexed for four-sided use and easy to replace in Maxwell's cutter body, are features of the Maxwell line of carbide cutting tools. The boring or



reaming bar doesn't have to be removed from the machine to replace or index tips. Tools come in 1/16" increments from 1⅜" to 6" dia. Maxwell Industries, Inc., 493 5th Ave., Ashtabula, Ohio, or—**Circle No. A51.**

Standard Screw Machine Cutting and accessory tools are described in a bulletin from George L. Detterbeck Co., 1871 Clybourn Ave., Chicago 14. Items are shown in blueprint form with specifications. For your copy of this bulletin, write to the company, or — **Circle No. A52.**

LODDING'S LITTLE FELLOWS



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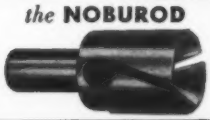

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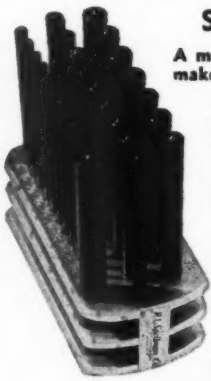

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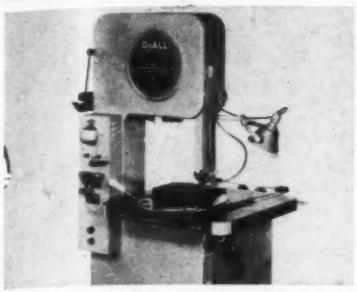
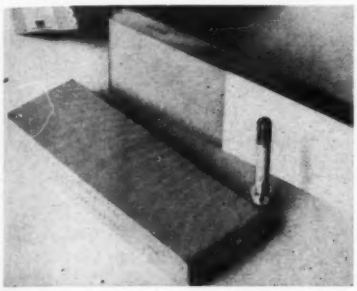


file, band-polish, and friction-saw thin ferrous work. For information, write The DoAll Co., Des Plaines, Ill., or—**Circle Inform-A-Gram No. A53.**

Produce External Screw Threads in fine and coarse thread series with a line of aircraft-quality thread roll dies. Made of special alloy steel to controlled metallurgical specifica-

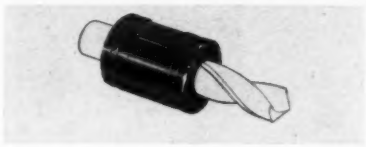


tions, these dies are ground after heat treatment for maximum accuracy, and come in sizes from No. 6-32 to 1"-14. Standard Pressed Steel Co., Jenkintown, Pa., or — **No. A54.**

A Mist Coolant Dispenser for milling, sawing, and drilling machines eliminates hand brush-on methods. Compressed air passes into a fine nozzle to provide a readily-controllable fine mist of coolant oil and air. National Aircraft Corp., Union, N. J., or — **No. A55.**

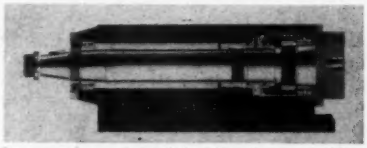
A Continuous-Path Magnetic Tape System for controlling motions and auxiliary functions of machine tools and other motion control processes is now available. The F series Factrol analog system is a standardized unit using identical "packages" for all machine tools and processes requiring motion control. Literature is available from Tracer Control Co., Hazel Park, Mich., or — **No. A56.**

Tremendous Gripping Power of this adapter bushing prevents tool slippage with less clamping screw pressure. A split-type construction clamps the entire length of the bush-



ing which can be used for all types of floating and adjustable toolholders. RingO Co., P. O. Box 863, Dayton 1, Ohio, or — **Circle No. A57.**

A Six-Spindle Precision Boring Head with hole-to-hole tolerance of 0.0002" has been introduced by Pope Machinery Corp., Haverhill, Mass. This head is equipped with six Pope



heavy-duty, precision boring spindles that bore holes round within millionths of an inch and produce fine surface finishes. For information, write the company, or — **No. A58.**

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The names of these nationally known organizations are available on request.

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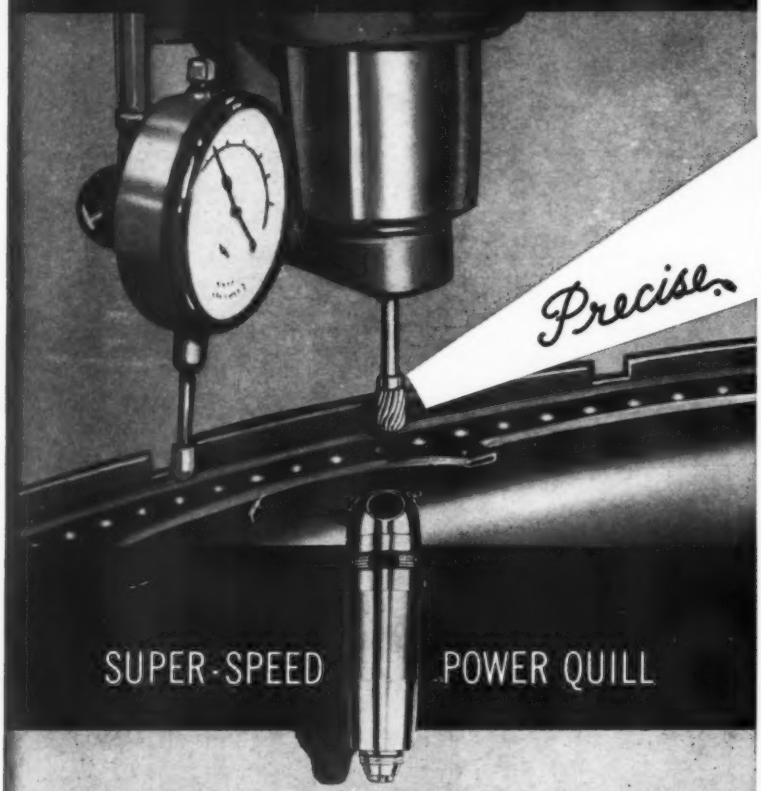
MICRO MILLING STAINLESS TO .001"
WITHOUT SHEET DISTORTION



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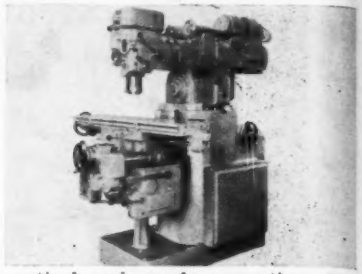
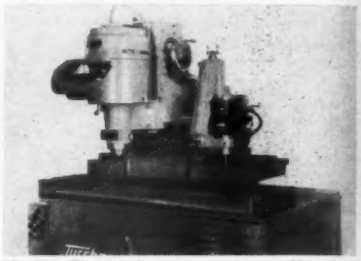
A Heavy-Duty Vertical Head is an optional accessory for the Quartet milling machine. The 3-hp quill-type head increases the machine's range and is adaptable to horizontal,



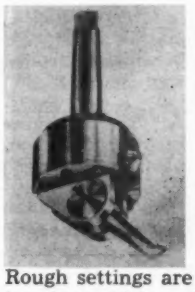
vertical, and angular operations. The quill has a 4⅝" dia and 6" travel. For information, write U. S. Burke Machine Tool Div'n, Brotherton Rd., Cincinnati 27, or — **Circle No. A59.**

A New Hydro-Router is equipped with the Turchan tracing control, a stationary table to accommodate large overhanging workpieces, and a completely enclosed power unit. The



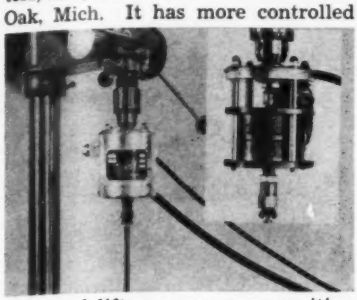
Hydro-Router's accurate adjusting assembly eliminates errors, and its tracer valve permits easy disassembly. Turchan Follower Machine Co., P. O. Box 6055, Dearborn 9, Mich., or—**Circle Inform-A-Gram No. A60.**

Precision Spindles for lathes, shapers, slides, feeds, and tables are presented in a bulletin. Dimensions and diagramed illustrations are provided for each item. Get Catalog 21 from The Standard Electrical Tool Co., 2488-96 River Rd., Cincinnati 4, or—**Circle Inform-A-Gram No. A61.**



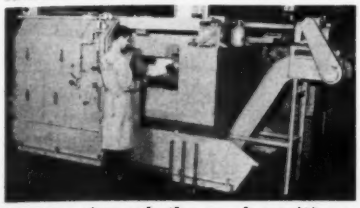
ABC Mark II Boring Head features a wide capacity range from ⅜" to 5". Used on lathes, milling machines, or drill presses, the head has a 2¼" dia and is 2" long. Rough settings are made by swiveling the tool bit, and fine adjustments are handled by a micrometer slide reading in 0.001". Production Equipment Co., Box 82, Glenolden, Pa., or **Circle Inform-A-Gram No. A62.**

Remove Broken Taps and Drills with the new type disintegrator head manufactured by Jiffy Disintegrators, Inc., 1503 E. 11 Mile Rd., Royal Oak, Mich. It has more controlled



drive and lift power, more sensitive vibration control, and more concentricity. Write to the company for more information, or — **No. A63.**

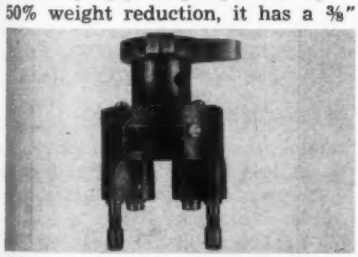
Concentricity of all diameters is maintained on the Model 412/25 multiple-spindle copying lathe because work stays on the same centers for all operations. Both the driving spindles and tailstock centers index



together through the work positions. Turning capacity is 7". The New Britain Machine Co., New Britain-Gridley Machine Div'n, New Britain, Conn., or — **Circle No. A64.**

"Milling Cutters" is a 48-page bulletin which describes standard and special high speed steel or carbide tipped types, as well as broaches, grooving tools, boring tools, and other special purpose tools. Bulletin 571 is available from Cowles Tool Co., 2096 W. 110 St., Cleveland 2, or **Circle Inform-A-Gram No. A65.**

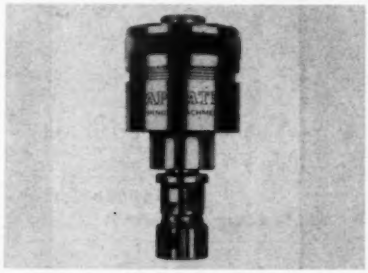
Use the Lightweight Adjustable Drill Head on drill units and bench drill presses where space is limited. Its clamping principle permits up to 50% weight reduction, it has a ⅜"



drill capacity, and is made with 2, 3, or 4 spindles. Errington Mechanical Laboratory, Inc., Staten Island 4, N. Y., or — **Circle No. A66.**

A Micrometric Adjustable Arbor Spacer that reduces setup time as much as 75% is described in a bulletin. It enables cutters, collars, and spacers to be assembled to the desired widths, plus or minus tenths, with infinite adjustment of the dial. Get this bulletin from The O K Tool Co., Inc., 71 Elm St., Milford, N. H., or—**Circle Inform-A-Gram No. A67.**

A New Tapping Attachment is designed for use on machines with reversing spindles such as lathes, jig borers, and screw machines. Models 400, 600, and 800 have floating axial



movement, eliminating lead pressure by operator. The Torque Tone adjustable clutch warns operator when taps become dull. Tapmatic Corp., 845 W. 16th St., Costa Mesa, Calif., or—**Circle Inform-A-Gram No. A68.**

Three Directional Feed is a feature of the new OM5 vertical Rigidmil designed for heavy cuts on large workpieces. The 50-hp vertical head is mounted on a fixed column for

maximum rigidity. Vertical, transverse, and longitudinal feed movements, feed rates, and rapid traverse are pushbutton controlled from the swinging pendent. Sunstrand Machine Tool Co., Rockford, Ill., or — **Circle Inform-A-Gram No. A69.**

"Production Drilling Machinery," a 58-page catalog, gives a description, dimensional drawing, and specifications for each item. Included are standard and cam-fed drilling and tapping machines, milling machines, index tables, and special models. Engineering Bulletin 58 is supplied by The Avey Division of The Motch & Merryweather Machinery Co., 1250 E. 222nd St., Cleveland 17, or — **Circle Inform-A-Gram No. A70.**

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HIGH PRECISION SMALL BORE GAGE

- MINIMUM BORE 1/16"
- READINGS IN .0001"
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- 3 SETS, fully equipped with Rings and Measuring Heads for complete range.

DiaTest measures out-of-round, tapers, incomplete bores and all other variations to .00008" accuracy.

All parts available separately.

EACH SET complete with dial indicator in walnut case.

SET No.	RANGE	MEASURING HEADS	SETTING RINGS
E-1	.057"-.170"	8	8
E-2	.165"-.390"	9	9
E-3	.372"-.828"	9	9

NEW ACCESSORIES AVAILABLE

- RIGHT ANGLE ATTACHMENT — permits gaging without removing work-piece from under bore spindle.
- EXTENSION RODS—may be used to length of 30" without loss of accuracy.
- DEPTH ADJUSTER—used in conjunction with extension rods, permits readings to any defined depth.

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KUTMORE ADJUSTABLE HOLLOW MILLS

A MIGHTY MIDGET!

This Midget Floating Holder Hollow Mill, flange type, has micrometric adjustment, and is designed to permit easy compensation for any spindle misalignment. Small, sturdy, extremely accurate!

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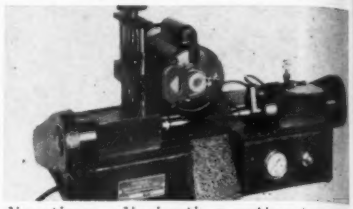
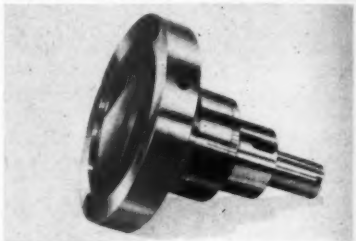
Deburring Both Sides of Holes from 1/32" to 1/2" dia is now possible on this opposed-spindle bench machine. Spindles rotate in opposite



directions, eliminating cutter torque for safe hand feeding. Model Machine Co., Inc., 4729 Hawthorne St., Philadelphia 24, or — **Circle No. A71.**

"How to Reduce Costs and Improve Precision in Circular Spacing and Angular Positioning" is a booklet that discusses applications and types of precision rotary tables. Specifications along with illustrations are given for each type. Get your copy from Pratt & Whitney Co., Inc., Charter Oak Blvd., W. Hartford 1, Conn., or — **Circle No. A72.**

A Precision Boring Head can finish-bore a hole on the withdrawal stroke or retract its tool bit to prevent marking of the finished bored hole as the head is withdrawn. Re-

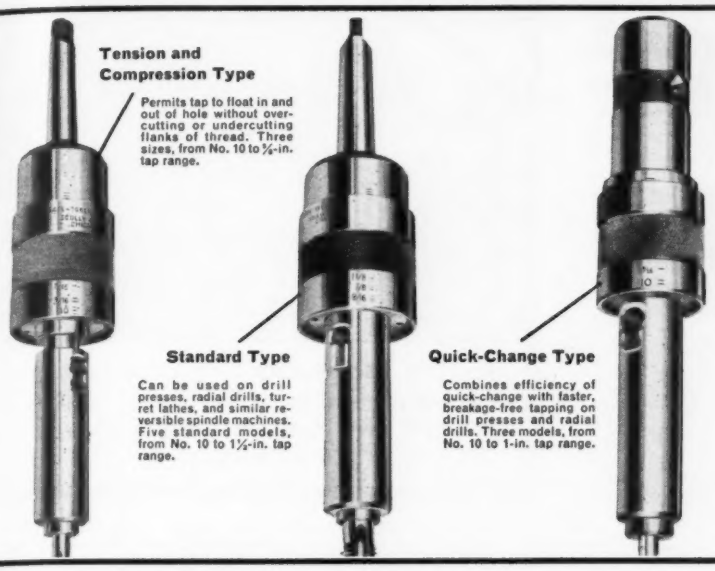


traction and feed-out can be handled automatically without interrupting machine cycle or stopping spindle rotation. Briney Mfg. Co., 1165 Seba Rd., Pontiac, Mich., or — **Circle Inform-A-Gram No. A73.**

The Adjusto-Quick Drill Press Vise is one of the products featured in a new catalog of metalworking tools. It includes specifications for lathe chucks, magnetic chucks and demagnetizers, and L-W dividing heads. Get your copy from L-W Chuck Co., 72 S. St. Clair St., Toledo 4, Ohio, or — **Circle No. A74.**

A 20-Page Pneumatics Products catalog features air line filters, regulators, and lubricators. Engineering and operational data, including performance characteristics, "quick sizing" charts, and specifications, are given. Catalog 616 is available from Watts Regulator Co., Industrial Div'n, Lawrence, Mass., or — **Circle Inform-A-Gram No. A75.**

How to make "guaranteed annual profits" on your tapping operations


Tension and Compression Type
Permits tap to float in and out of hole without overcutting or undercutting flanks of thread. Three sizes, from No. 10 to ¼-in. tap range.
Standard Type
Can be used on drill presses, radial drills, turret lathes, and similar reversible spindle machines. Five standard models, from No. 10 to 1½-in. tap range.
Quick-Change Type
Combines efficiency of quick-change with faster, breakage-free tapping on drill presses and radial drills. Three models, from No. 10 to 1-in. tap range.

Scully-Jones "SAFE-TORQUE" tap drivers stop breakage, increase production, reduce salvage costs

EXAMPLE: Efficiency increased 10 per cent on a radial drill, tapping blind holes in steel cases. Tap life increased 400 per cent.

Now you can increase spindle speeds when tapping on single- or multiple-spindle machines, with guaranteed profitability . . . because Scully-Jones "SAFE-TORQUE" tap drivers practically eliminate breakage. On one job, for example, only two taps were broken out of a run of 500,000 holes—former average was a broken tap for every 200 holes.

If you're breaking taps, chances are the cost of salvaging parts would more than pay for the driver. Instant and complete release below the break strength of the tap practically eliminates costly rework, scrap, and machine downtime due to tap breakage.

The difference between the Scully-Jones "SAFE-TORQUE" tap driver and other tools on the market is the overrunning roller drive and freewheeling release. There are no vibrating ratchet teeth, no friction discs or cones to heat up and change the torque setting. Torque remains constant no matter how many times the driver releases. You get dependable protection against hard spots, inadequate lubrication, dull or improperly sharpened taps, bottoming in blind holes, and other adverse machining conditions that reduce efficiency and increase costs. Write for complete information in Bulletin No. 20-50. Scully-Jones and Company, 1913 S. Rockwell St., Chicago 8, Illinois.

SCULLY JONES *PRECISION HOLDING TOOLS*

CIRCLE INFORM-A-GRAM KEY NO. 1331

REID TOOL ROOM *Accessories*

MALLEABLE MACHINE HANDLES

Made in straight, crank and offset as shown. Finest on the market. Large variety of sizes. Designed to withstand severe usage. Neat in appearance. Finished ready for use. Moderate in cost.

THE REID LINE Includes scores of other tool room needs such as plastic and steel ball handles, C.I. hand knobs, C.I. hand wheels, compression springs, balanced cranks, clamping levers, etc.

Quality at Moderate Prices!

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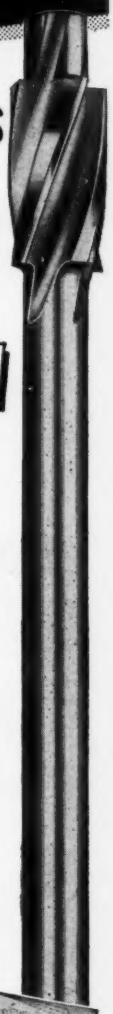
REID TOOL SUPPLY CO. Muskegon Heights, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 1332

FASTER FEEDS WITH . . . SUPERBORE



THE COUNTERBORES WITH

Standard

1/64" Oversize

1/32" Oversize

Available from stock for each screw size

30° Right Hand Spiral, 4 Flute

Now you can speed up production 100% with our *New* **30° mark right hand spiral,** four-flute counterbores.

You will find that faster feeds are possible with this freer-cutting tool.

Hardened counterbore blanks in stock can be ground to any special pilot and flute diameters in one week.

Few territories open for manufacturer's representatives.

Free

Complete Reamer catalogue with world's Greatest Reamer selection by the Thousands' and thousandths.

Write for it today!

TWENTIETH CENTURY MANUFACTURING CO.

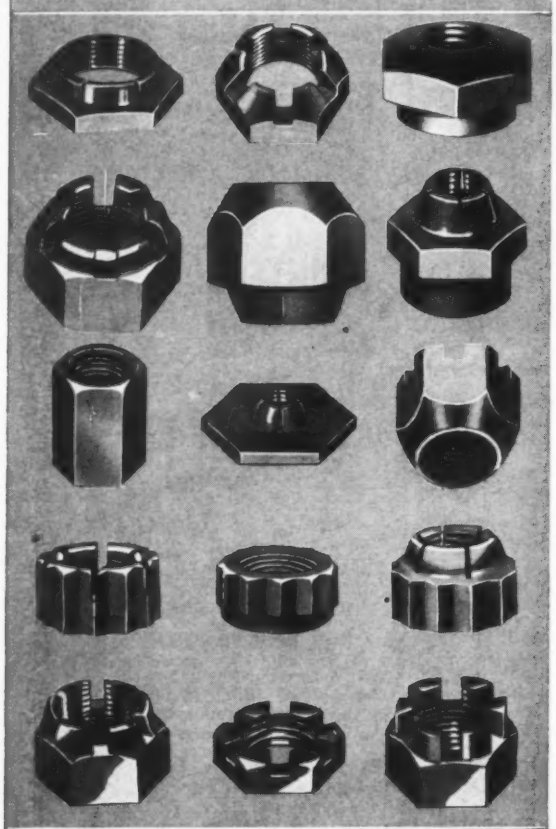
ROUTE 176 and BRADLEY ROAD BOX 429TP, LIBERTYVILLE, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1333

SPECIAL NUTS

to specs. 7/16"—4¼" cross flats

special machines + large stock of material × years of experience = speedy deliveries high quality low prices



Here are a few samples made to customers specifications . . Our batteries of special high-speed multi-spindle, automatic machines make possible fast and accurate production of hexagon nuts of non-standard height and special shape from carbon or alloy steel, Naval bronze or other non-ferrous metals; also AN 310 through AN 335 as per latest Airforce specifications. Very often the special nut you require may be similar to one we are already making and a simple modification would result in a price advantage and quicker deliveries to you . . Send us your blueprint and particulars —let us quote on your requirements . . We also have a catalog that contains complete specifications, engineering data and prices regarding our standard nuts.

*12 Pointer Standards, sizes: ¼" to ¾"—brochure on request

NATIONAL MACHINE PRODUCTS

*Manufacturer of Standard and Special *12 Pointer and Hexagon Nuts . . . "Huglock" and "Marsden" locknuts.*

44225 Utica Rd., UTICA, Michigan

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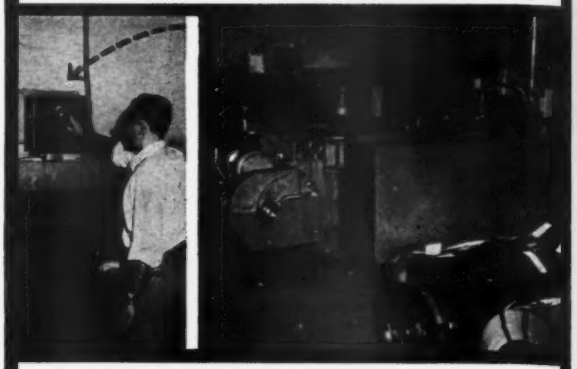


Sperry Monitron increases production, saves man-hours, protects cold-headers in the manufacture of General Electric Telechron Clocks

This cold-header automatically stamps out clock parts in complete safety. MONITRON will stop the machine the instant that it senses a load change, pile-up, misfeed, dull tool, oversize stock, faulty lubrication, etc.

MONITRON is easy to install . . . needs no attention . . . but gives electrically driven presses, conveyors, pumps, automatic machine tools, etc., *every* attention!

Write for complete information. Just attach this advertisement to your company letterhead, give your name and title, and mail to:

Sperry **SPERRY PRODUCTS, INC.**

406 Shelter Rock Road, Danbury, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 1342

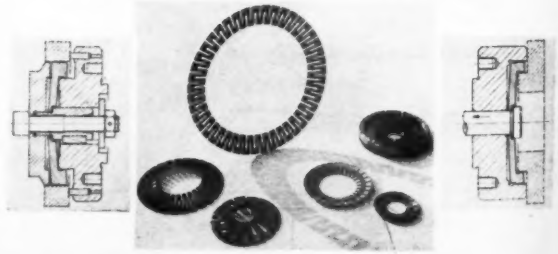
RINGSPANN DISCS

The New Precision Method for Clamping and Centering of Workpieces . . .

Eccentrics, Joints, Quills and Column Sleeves; Tightening of Pulleys & Gears on Shafts, Fastening of Dials, etc.

Flat, delicate pieces as well as heavy parts are held securely and concentrically.

THE ECONOMIC METHOD



NEISE MODERN TOOLS **KARL A. NEISE** Dept. T.P.

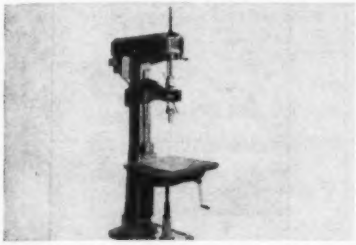
404 4th Ave., New York 16, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1343

"Tungsten Carbide Tools," a 48-page catalog, describes drill bushings, drills, end mills, reamers, gages, and centerless grinding fixtures. Dimensional data and product application information is given in this Catalog T-58, available from S & E Machine Products, Inc., Bridgeport, Mich., or — **Circle No. A76.**

"Hardened and Ground Threading Heads" describes the Landis line of hardened and ground die heads for producing threads requiring the utmost in concentricity. It also contains detailed information on design and operating features. Bulletin F-80-7 is available from Landis Machine Co., Waynsboro, Pa., or — **Circle Inform-A-Gram No. A77.**

This Sensitive Drilling Machine features a multi-spline spindle that won't drop of its own weight when drilling stops. A constant upward

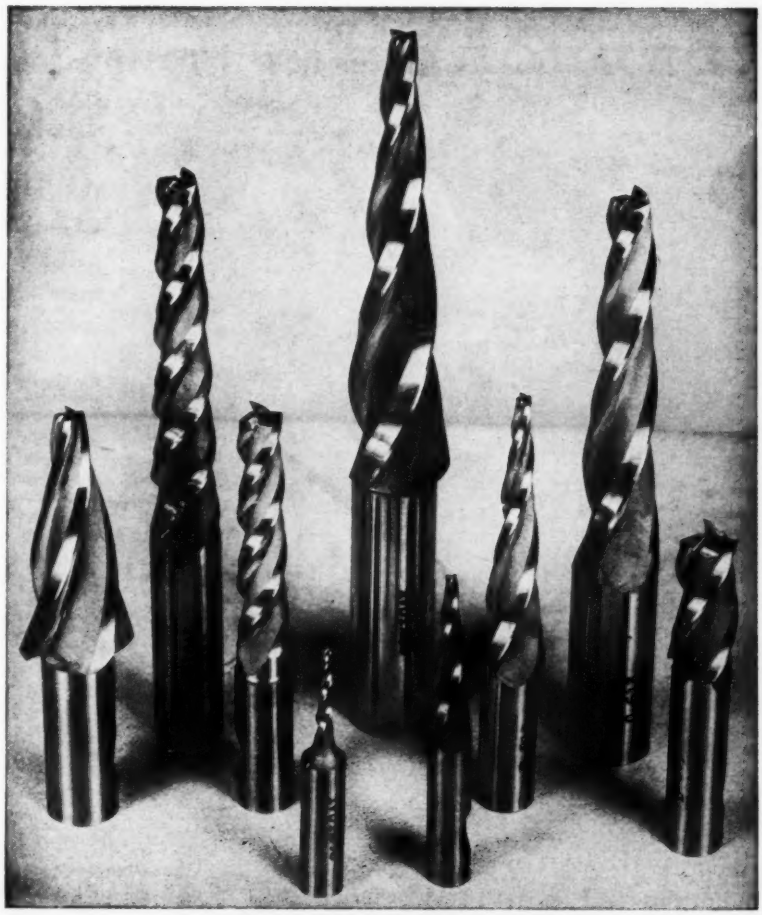


pressure eliminates vertical lost motion. Capacity is 1" in cast iron and ⅝" in mild steel with 12" center distance. Lennox Tool and Machine Builders, Lima, Ohio, or — **No. A78.**

Automatic Drilling and Tapping Units, both air or hydraulic powered, are described in a bulletin from Hypneumat Inc., 647 W. Virginia St., Milwaukee 4. Specifications, illustrations of basic construction, and applications are presented. Get Bulletin 5810 from the company, or — **Circle Inform-A-Gram No. A79.**

A 48-Page Twist Tool and Drill Catalog now includes information on carbide and carbide tipped drills and reamers. Specifications for straight shank twist drills, drill blanks as small as 0.0059" dia, and other tools can be found in Catalog C-58 published by Precision Twist Drill and Machine Co., 10 Woodstock St., Crystal Lake, Ill., or — **Circle No. A80.**

FOR ADDITIONAL INFORMATION regarding advertised products or editorial items, use the Inform-A-Gram card following page 98.



Attach this page to your letterhead and forward for our new 16-page catalog.

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Stops Losses making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
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With DYKEM Steel Blue
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NON-ROTATING SPINDLE BLADE TYPE MICROMETERS
For Measuring of narrow depth grooves, slots, keyways, splines, square threads, recesses and similar "hard-to-measure" surfaces.
Minute micrometer movements without damage to fragile surfaces
Available Carbide-tipped
BLADE THICKNESS .030" GAGING DEPTHS TO ¼"
Spindle and Anvil Blades are hardened, ground and lapped to contact fit
Spindle moves but does not turn!
TUMICO
Graduated in .001" Ranges: 0-1", 1-2", 1½-2½", 2½-3½", 3½-4½" and others
Sold thru Tool Supply Houses
NON-ROTATING SPINDLE BLADE TYPE MICROMETER HEAD
...to be built into fixtures, machine tools, delicate instruments and cross-slides.
WRITE FOR ILLUSTRATED FOLDER Code-GIPUX
GEORGE SCHERR CO., INC. 200-T LAFAYETTE STREET • NEW YORK 12, N. Y.

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BEDFORD'S new type Top-Jaws ADJUSTS TO YOUR T.I.R. REQUIREMENTS!

GREATLY REDUCES FIXTURE COSTS, SET-UP COSTS . . SOFT TOP-JAW EXPENSE on turret lathes, boring mills, in milling and grinding departments, in tool rooms.

- Cuts run-out within minutes, to less than that obtained in an independent jaw chuck.
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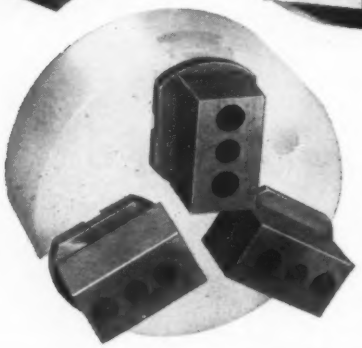
- Jaws can be bored to specific job, hardened, and trued many times without any additional grinding or boring.



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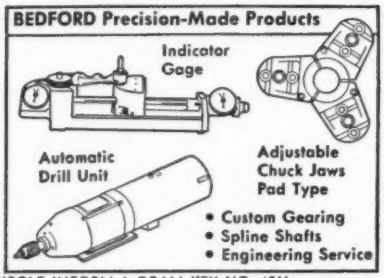

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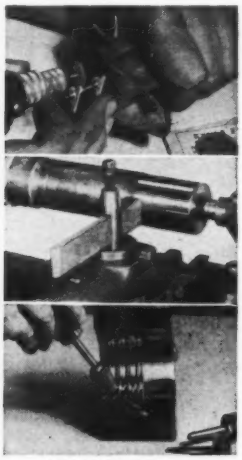

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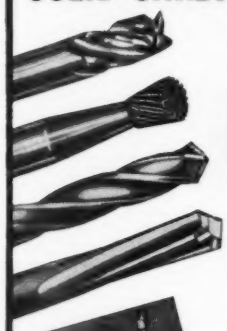
"Raymac"

SOLID CARBIDE CUTTING TOOLS



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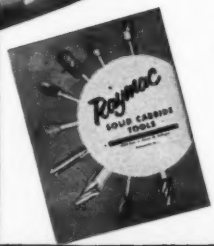
TOOLS AND OTHER SPECIAL TOOLS

Up to 25% Longer Life

Finest quality solid carbide ground and lapped to the sharpest cutting edges make "Raymac" tools the quality standard of the industry. More parts produced per tool and per regrind.

Make "Raymac" your standard.



GET OUR CATALOG NO. 15

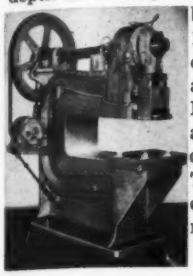
"Raymac" Division—DEXCO CORPORATION
15490 Dale • Detroit 23, Michigan

CRCLE INFORM-A-GRAM KEY NO. 1363

Pressworking

PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS

A 45-Ton Heavy-Duty Deep-Throat Press with end flywheel has a 36" depth of throat, 4" dia shaft at pin bearing, 24" x 16" bed area, 14" open height, and alloy cast frame. Model 15M is available in plain or geared models. The Perkins Machine Co., Warren, Mass., or — **Circle No. A81.**



Automatic Press Room Equipment, including slide feeds, roll feeds, air-operated feeds, stock straighteners, stock reels, coil cradles, and combination cradles and straighteners, are described and illustrated in a catalog. Get details by writing U. S. Tool Co., Inc., Ampere, N. J., for Bulletin 85, or — **Circle No. A82.**

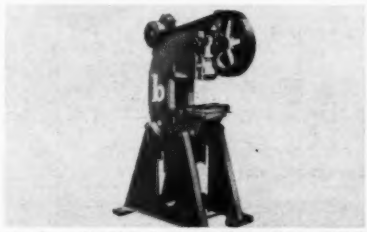
A Roll Feed fits bench- or floor-type presses of up to 7½-ton capacity, assures accuracy on normal or high speed press work, and can handle material up to 2" wide. It feeds stock up to 1¼" long and 0.100" thick. Durant Tool Co., Thurbers Ave., Providence, R. I., or — **No. A83.**

The All-Steel Welded Torc-Pac OBI Press is described in a bulletin which explains design features. Dimensions are given on detailed diagrams and a chart gives specifications for three models. Write to Clearing Machine Corp., Div'n of U. S. Industries, Inc., 6201 W. 63rd St., Chicago 38, or —

Circle Inform-A-Gram No. A84.

A Lightweight, Bench-Type Air Press for sizing and finishing internal diameters does not need hand tools to change setups from one part to another. A variety of parts can be hand fed and up to 1,200 pcs/hr can be ballized with this press. Industrial Tectonics, Inc., 3686 Jackson Rd., Ann Arbor, Mich., or — **No. A85.**

An 8-Ton Deep-Throat Punch Press, designed in three shut heights with throat depth punching to the center of circles up to 24" dia, is available from Benchmaster Mfg. Co. The 90 Series has a standard

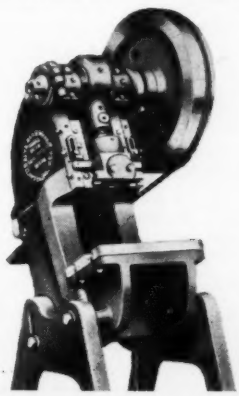


stroke of 1¼", but strokes from 1½" to 3" can be supplied. Bed area is 8" x 11". For information, write Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif., or — **No. A86.**

Cut Die Changeover Time with three press developments of E. W. Bliss Co., 1375 Raff Rd., S.W., Canton, Ohio. They are the moving bolster plate, an automatic die clamping device, and an automatic slide

positioning device. The bolster plate idea (pictured) is applicable to all types and sizes of presses to speed die change. For information, write the company, or — **Circle No. A87.**

A 12-Ton Power Punch Press tilts full 30° and is available in either bench or floor models. Model BT-12 has a large die space with 5" throat, and standard 1¾" stroke and bolster plate. The clutch can be changed easily from single stroke to continuous action. Alva Allen Industries, Clinton, Mo., or — **Circle No. A88.**



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FEELER STOCK • Made from tempered stock, rolled to close tolerances, ½" x 25' coils packaged in transparent plastic boxes, except above .020". Strips ½" x 12", in cellophane. 27 thicknesses. All thicknesses from .001" to .032". (For use in precision fitting, checking clearances, inspection and production work.)

SHIM STOCK • Steel or brass. Selected from material rolled to precision limits, free from burrs, and protected by oil coating. Coils packed in carton for easy dispensing and protection. 15 thicknesses, .001" to .032". Sheets 6" x 12"; coils 6" x 120". Available also in two assortment packages —12 thicknesses, .001" to .015", and 15 thicknesses, .001" to .032".

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DETROIT STAMPING CO.

344 Midland Ave. Detroit 3, Mich.

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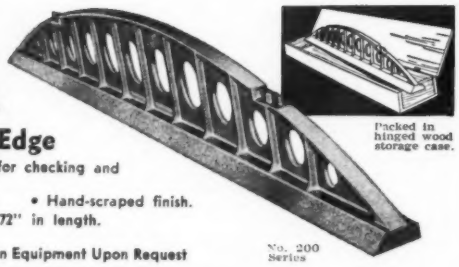
Check & Mark Machine Tool Beds With This

BEVEL EDGE **DOVETAIL**

Precision Straight Edge

- All-around useful in tool room for checking and marking beds and ways.
- Furnished in any desired angle.
- Hand-scraped finish.
- Available in sizes from 18" to 72" in length.



Packed in hinged wood storage case.

No. 200 Series

Illustrated Catalog of "Milwaukee" Precision Equipment Upon Request

J. C. BUSCH COMPANY *Engineers & Machinists* SINCE 1907

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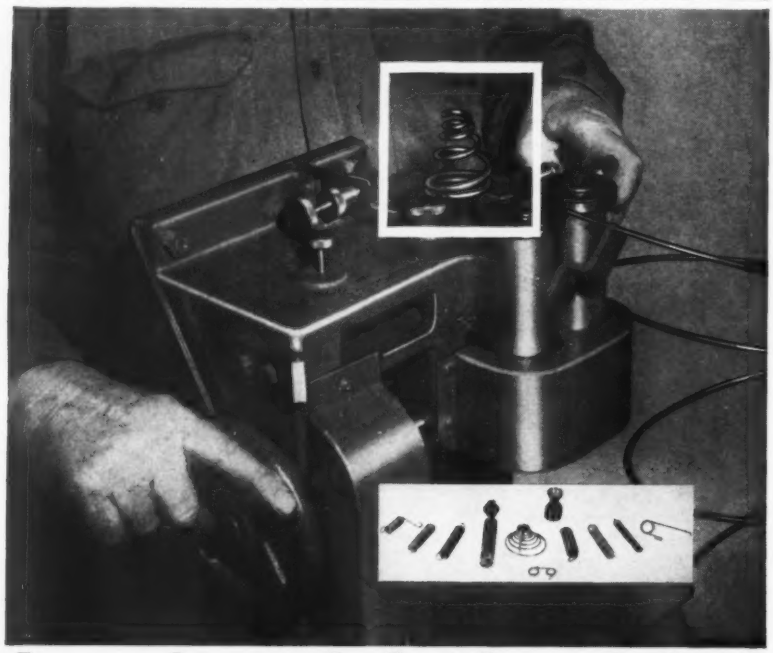

Any spring made fast in your shop!

WITHOUT USE OF ARBORS

For a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005" to .125", you can produce it in a matter of seconds with Perkins Precision Spring Coiler. You eliminate arbors, yet turn out precision springs — torsion, compression, extension, tapered, or special springs, coiled either left or right hand, in any desired length, any diameter from 3/32" to 12" and larger, with or without initial tension, and with open or closed ends. Eliminate expensive special orders and costly production delays! Make your own springs to exact specifications as replacements or experimental work. Make them fast, right in your own shop!

PERKINS MACHINE AND GEAR CO.
Special Machinery Division, West Springfield, Mass.

Starret adjustable jaw cut nippers (left) and Gardener Hook-Kon spring looping tool (center) — handy, precision, time-saving accessories for spring coiling. Perkins Spring Coiler available as bench model or power model shown here, (right) for tool shop or continuous runs.

Perkins Machine and Gear Co.
Special Machinery Division, Dept. 182
W. Springfield, Mass.
Please send information and prices on Perkins Spring Coiler.
Hand Model ☐ Power Model ☐

Name.....Title.....
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Address.....
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NEW 1958 CATALOG

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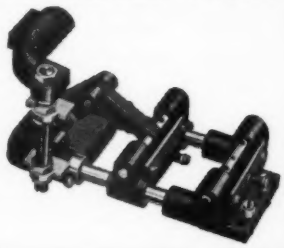
CIRCLE INFORM-A-GRAM KEY NO. 1383

A SURE FEED



PRODUCTO AUTOMATIC "SUREFEED"

Your pressroom can produce more with this compact, durable stock feed. Can be mounted right on die set to save you time. Direct linkage feeding affords greater accuracy. Comes in 2" and 3" sizes. Write for detailed bulletin on this cost-cutter.

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LIFTING DEVICES

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FAST • SAFE • BETTER
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400 MODELS

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Design Assistance Offered

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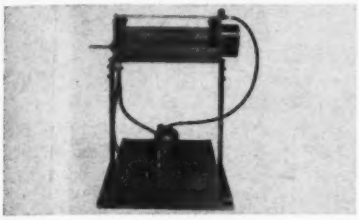
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1386

A Coil Weight and Length Calculator determines weights and lengths of steel, brass, and aluminum coils for easy ordering. To operate, just know coil OD and ID

and stock width and thickness. Get one from F. J. Littell Machine Co., Publications Div'n, 4101 N. Ravenswood Ave., Chicago 13, or — **No. A89.**

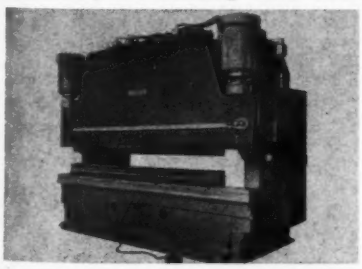
A Heavy-Duty Strip Stock Oiler with forced feed lubricates strip stock leading to a press at any desired height. Model B handles 26 to 7 gauge stock in widths from 24"



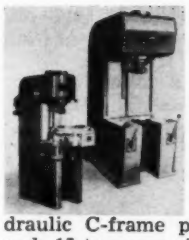
to 72". Light, medium, or heavy oils may be used. Stamping Specialty Co., Inc., 2141 N. Sherman Dr., Indianapolis 18, or — **Circle No. A90.**

"Multiple Rotary Slitting Lines," a 76-page catalog, offers basic information on Yoder slitters and allied equipment. Tips on design, selection, methods of coil handling, and scrap disposal are discussed. Specifications are given for various models. Get this catalog from The Yoder Co., 5500 Walworth Ave., Cleveland 2, or **Circle Inform-A-Gram No. A91.**

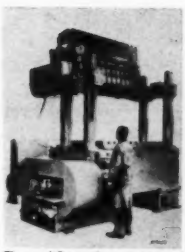
A Line of Hydraulically-Operated Steelweld Press Brakes are now available in various capacities up to 2000 tons, for bending mild steel



from 10 gauge to 2" and in lengths to 30'. Pictured is a 5000-ton model with 14" stroke. The Cleveland Crane & Engineering Co., Wickliffe, Ohio, or — **Circle No. A92.**

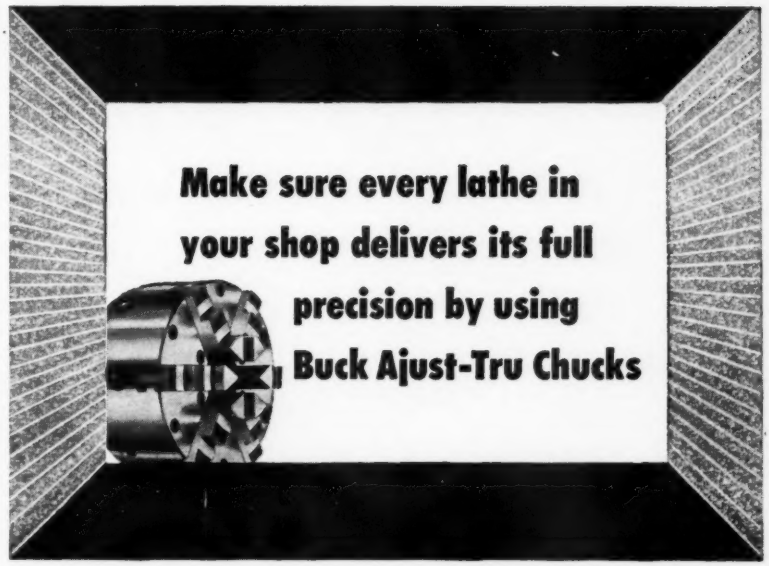


For Special-Purpose high speed applications or for general purpose jobs using interchangeable tools, use these hydraulic C-frame presses in 5-, 10-, and 15-ton capacities. The index table has a work circle of 16" with 6, 8, or 12 stops and can carry a work load of 100 lbs. The Hydraulic Press Mfg. Co., a Div'n of Koehring Co., Mt. Gilead, Ohio, or — **No. A93.**



A 300-Press has a slide that rotates up to 220° from its normal position, permitting the die maker accessibility to the die with full safety. Specifications include 8" stroke of slide, 36" shut height, and 84" x 48" bed area. For information, write Alpha Press & Machine, Inc., 9281 Freeland Ave., Detroit 28, or — **A94.**

THIS-makes *SENSE*



All good lathes today have spindle accuracy to tenths. Conventional scroll chucks are only guaranteed to .003" *when new.*

Since Buck Ajust-Tru scroll chucks provide *dead true* precision — and guarantee .0005" on duplicate parts — they give you *full value* from your lathes.

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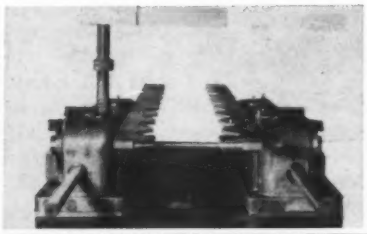
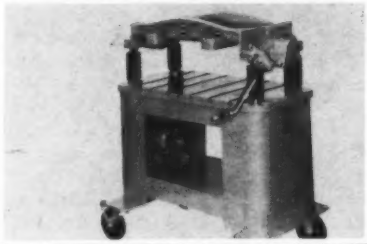
A Transfer Unit, also adaptable for drilling and tapping, is actuated by the movement of the ram. Travel of the fingers in and out, and longitudinal travel, can be adjusted in the press. Model A with 33" length and model B with 80" are available from Livernois Engineering Co., 25200 Trowbridge, Dearborn, Mich., or—**Circle Inform-A-Gram No. A95.**



A Small Die Handler has all cast construction for rigidity and accuracy and motorized vertical movement for time-saving rapid traverse. Four-lead-screw construction with thrust bearings allows off center pull or off center tryout forces up to 1000 lbs. Hansford Mfg. Corp., 1239 University Ave., Rochester 7, N. Y., or—**Circle Inform-A-Gram No. A96.**



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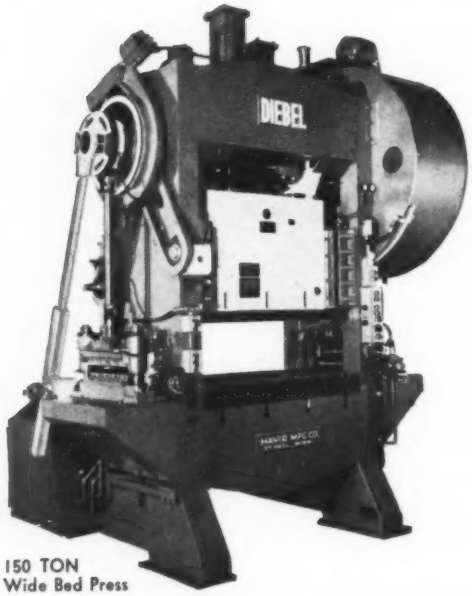

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Deflection is practically eliminated in both frame and crankshaft to provide maximum die life. Straight side frame construction with all members keyed together produces the most rigid frame possible. Extra crankshaft bearing area cuts crank deflection to an absolute minimum. Longer runs between die sharpening cuts costs to the bone.

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POWER PRESSES

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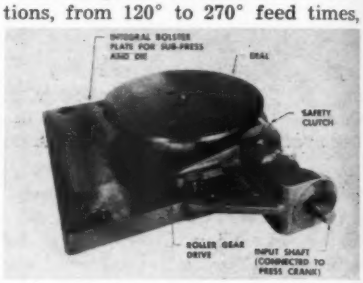
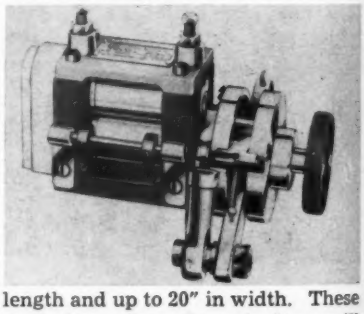
Eliminate Whipping and assure uniform bends and increased production with the Joggit automatic brake control. It automatically and uniformly controls ram movement through the work at a pre-set rate, eliminating mechanical foot lever brake operation. General Automation Corp., 40-66 Lawrence St., Flushing 54, N. Y., or — **No. A97.**

Rapid Change of Setups is a feature of the high speed, precision dial feed with integrated bolster plate for OBI presses up to 60 tons. Standard feeds are provided with 6 to 16 stations, from 120° to 270° feed times,



and rated for speeds up to 200 spm. Ferguson Machine Corp., 7818 Maplewood Industrial Court, St. Louis 17, or—**Circle Inform-A-Gram No. A98.**

Thirty-Nine Sizes of Automatic Roll Feeds for punch presses are now available from Jaco Devices, Inc., 96 High St., Hingham, Mass. Range of feed increments is from 1" to 20" in



length and up to 20" in width. These feeds, for side or rear feeding, will fit any light- or heavy-duty punch press. For information, write the company, or — **Circle No. A99.**

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Dependable, easy-to-adjust Empco Leveling Jacks provide a solid foundation for machine tools, large surface plates, automation lines, tool room and production equipment of all types. Periodic leveling? It's a matter of seconds! Simply turn hex-screws . . . your machine is set level . . . kept level!

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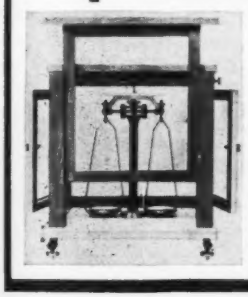

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With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon—high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

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The turning of a single hydraulic control knob clamps the specimen, tests it, then releases it The test is made in plain view, and the maximum pressure indicators show the result until reset. This highly sensitive sheet metal tester will take up to 3/16" thick specimens and exert up to 30,000 pounds pressure, at any desired rate of speed. Hydraulic mechanism is all neatly enclosed. Write for catalog sheet and prices.

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9386 *Grinnell Ave., Detroit 13, Mich.*
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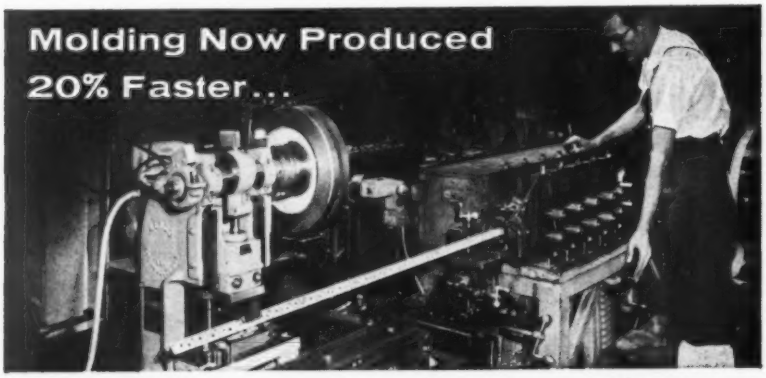


with KENCO 5-TON PUNCH PRESSES

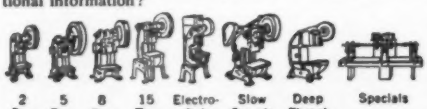
Steel molding is now made 20% faster with one operator from coil in one automatic operation, utilizing two Kenco 5-ton presses at Universal Molding Company, Lynwood, California. The first Kenco is fed continuously from a roll feed and operates at 500 strokes per minute to punch a standard hole pattern. Rollers then form the material into an angular molding which is cut off automatically (burr free) to lengths of 8' ± 1/16" in a Kenco 5-Ton Punch Press. Formerly the strips were sawed which left objectionable burrs on the ends. In 1½ years of operation of 1 and 2 shifts per day the Kencos had a *minimum of maintenance.*

Kenco Presses are precision built for maximum production—They weigh up to 30% more, permit up to 100% overloading, have solid crank shafts free from weakening slots, a driving dog that strikes a hardened and ground plate, and many other exclusive features that keep them on the job.

You too can increase production with Kenco Presses—and at the same time increase profit. Can we give you additional information?

Job Facts:
Company: Universal Molding Company, Lynwood, California • Machines: Two Kenco 5-Ton Punch Presses • Job: Making steel molding from coil • Accuracy: Cut-off 8' ± 1/16", Burr Free • Former Method: Sawing which Burred Ends • Shifts: 1 & 2 per day, for 1½ years • Maintenance: Very little • Savings: 20% Faster

Write for literature covering 2, 5, 8 and 15 ton Standard and Deep-Throated Kenco Presses.



KENCO
MANUFACTURING CO.
5211 Telegraph Rd., Los Angeles 22, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1422

Assembly

PRODUCTS&PROCESSES&PRODUCTS&PROCESSES

A Torque Control Unit in new Buckeye fastening tools features accuracy and simplicity of operation. The "One Shot" clutch has a ball and roller design that provides great accuracy in controlling torque limits within a range of 20 to 100 in-lbs. Buckeye Tools Corp., 5015 Springboro Pike, Dayton, Ohio, or — **Circle No. A100.**

An Automatic Precision Screw Feeder saves from 2 to 25 sec at each station for each work unit. It drives any type of headed screw, works to close tolerances, and can be attached to screw drivers, nut runners, etc. Zipp Screw Feeder Div'n, R. C. Neal Co., Inc., Dept. 132, 76 Pearl St., Buffalo 2, N. Y., or — **No. A101.**

Close - Tolerance Molded - Nylon Screws provide increased design flexibility in many applications. They're corrosion-resistant and stable over a wide range; many types are available from Gries Reproducer Corp., 400 Beechwood Ave., New Rochelle, N. Y., or — **No. A102.**

Two Lightweight Riveting Tools can be used for setting small rivets up to 3/16" dia in standard, overhead, or blind applications. One sets aluminum rivets of 3/32", 1/8", or 5/32" dia, and the other, an air-hydraulic gun, will pull monel rivets up to 3/16". Pop Rivet Div'n, United Shoe Machinery Corp., W. Medway, Mass., or **Circle Inform-A-Gram No. A103.**

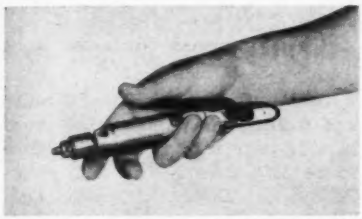
PRODUCTS&PROCESSES&PRODUCTS&PROCESSES

A Vibratory Bowl Feeder handles miniature parts at speeds up to 30,000 pcs/hr. The Micro-Feeder features a special sorting arm which

dispenses material in single file, and handles pieces down to 0.001" thick and 0.250" dia. Affiliated Manufacturers Inc., Lebanon, N. J., or — **Circle Inform-A-Gram No. A104.**

Two Air Impactools have been announced by Ingersoll-Rand Co., 11 Broadway, New York 4. Size 5091T torque control Impactool is for applications for accurate torque control in the 50 to 150 ft-lb range, and Size 5081 Impactool is used for nut running jobs up to ⅝" bolt size. For information, write the company, or **Circle Inform-A-Gram No. A105.**

Speed Up Light Fastening Production Jobs with a series of air-powered drills, screw drivers, and nut setters. Pictured is the Keller 11A-1 Drill



which provides high speed, sensitive drilling of small holes up to 5/32". For information, write Gardner-Denver Co., Quincy, Ill., or — **No. A106.**

Accuracy and Flexibility are features of the Model U magazine-fed power screwdriver. It's available as a floor type or without floor pedestal for use in automatic assembly machines incorporating straight-line transfers. Detroit Power Screwdriver Co., subsidiary of Link-Belt Co., 2801 W. Fort St., Detroit 16, or — **Circle No. A107.**

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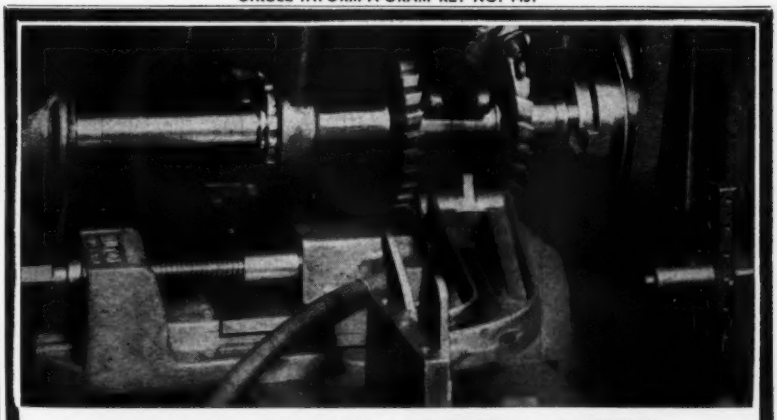
CIRCLE INFORM-A-GRAM KEY NO. 1431



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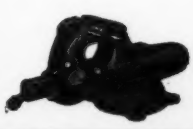

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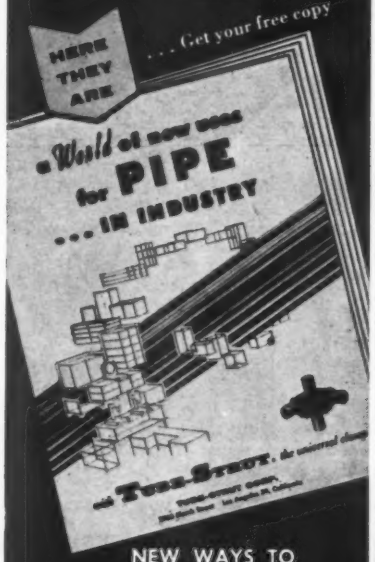

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CIRCLE INFORM-A-GRAM KEY NO. 1441

Grinding & Finishing

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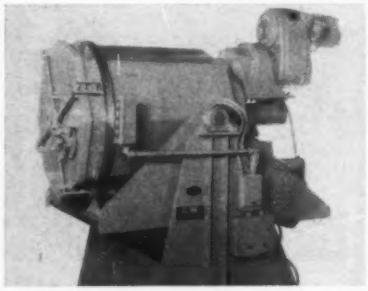
Micro-Feed Wheel Dresser, used for precision grinding, dresses wheel in 5 sec, and doubles life of the wheel. Special jigs and fixtures are not needed. Model 100 mounts permanently on grinder guard and is ready for use but out of the way. Nu-Dres Tool Co., 3225 W. Burleigh St., Milwaukee 10, or — **Circle No. A108.**

Deburr Small Pieces having hard-to-get-at places with the precision Airburr. It handles tool, die, and mold finishing, and fits standard ⅛" dia shank-mounted grinding wheels, carbide or high speed burrs, and

various polishing tools. Speeds up to 150,000 rpm with pressures from 10 to 1000 lbs are possible. Ellison Engineering Co., 4330 San Fernando Rd., Glendale 4, Calif., or — **A109.**

This Barrel Finishing Machine is a heavy-duty machine for deburring and burnishing parts. Model 30-34 HPT has a load capacity of 1500 to



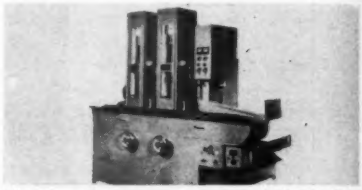
2000 lbs, with barrel capacity of 14.7 cu ft. For information, write Globe Div'n, Casalbi Co., 540 Wayne St., Jackson, Mich., or — **Circle No. A110.**

A New Honing Machine, Model AM, is one of the featured products in the 30-page catalog issued by the Superior Hone Corp., 1619 Elreno St., Elkhart, Ind. Four honing machines, two honing heads adaptable to drill presses, mandrel drivers, mandrels, and abrasive stones are also described. Write the company for your copy, or — **Circle No. A111.**

High-Volume Small-Parts Finishing, as well as fast-action finishing of large castings and forgings, is possible on the Supersheen EB-3032 barrel finishing machine. Total

capacity is 13.8 cu ft or 1,000 lbs, and it can be divided into two compartments if desired. ALMCO, Queen Products, Inc., Albert Lea, Minn., or **Circle Inform-A-Gram No. A112.**

A New Precision Abrasive Belt Grinder permits two or more high speed grinding and finishing operations in the same time formerly needed for one operation. Model



696 handles parts up to 5½" wide and 6½" thick. Heavy stock removal or fine polishing is possible. Engelberg, Inc., 831 W. Fayette St., Syracuse 4, N. Y., or — **Circle Inform-A-Gram No. A113.**

Straight-Line Automatic Polishing and Buffing Machines are presented in a 16-page catalog available from Acme Mfg. Co., 1400 E. 9 Mile Rd., Detroit 20. Design features, operating descriptions, typical applications, and dimensions are given for seven types of machines. Write the company for your copy, or — **No. A114.**

A Thread Ring Gage reconditioning kit for salvaging worn thread ring gages is now available. It contains thread lap and 600 grit lapping

compound which will remove minor nicks and scratches. Alameda Gage Co., 10851 Capital Ave., Oak Park 37, Mich., or — **Circle No. A115.**

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ALL SIZES OF ANGLE IRON thru and including
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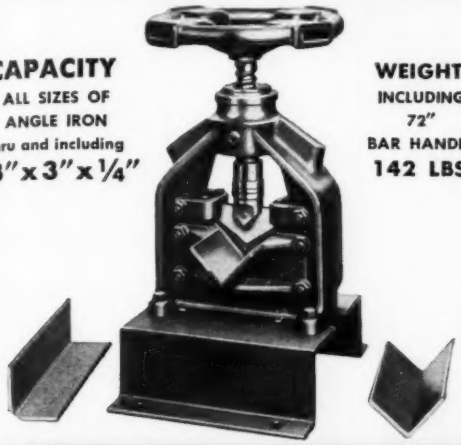

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Continental Motors	National Lead
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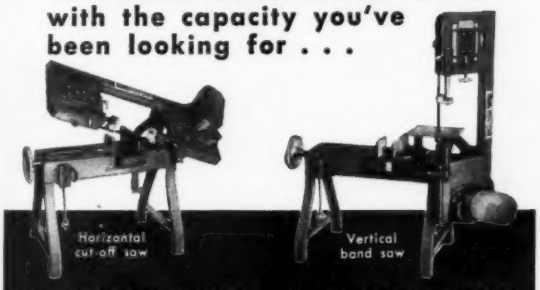

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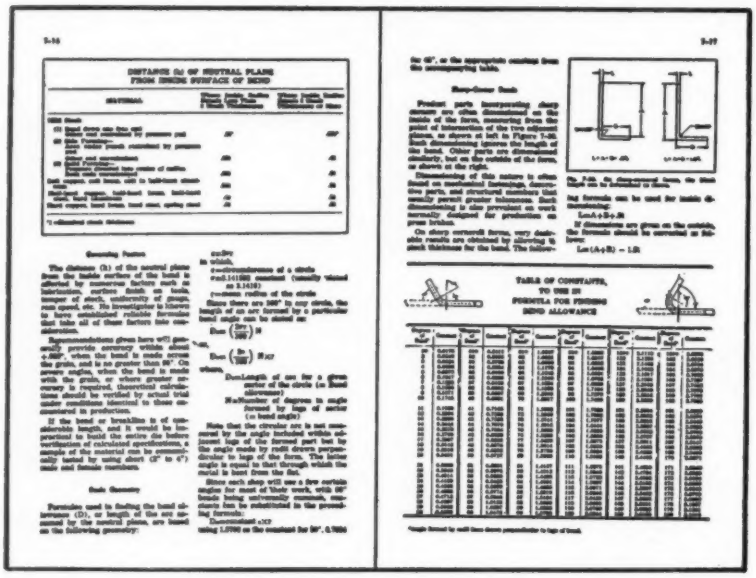

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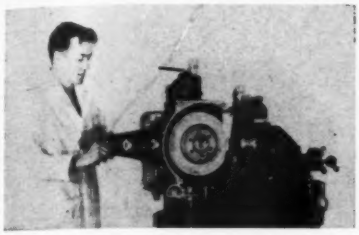

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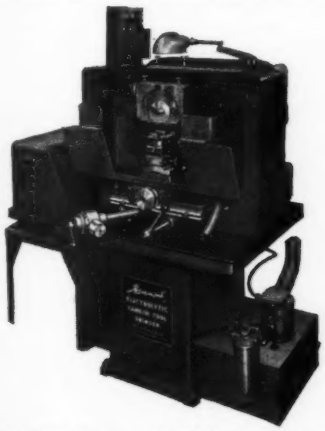

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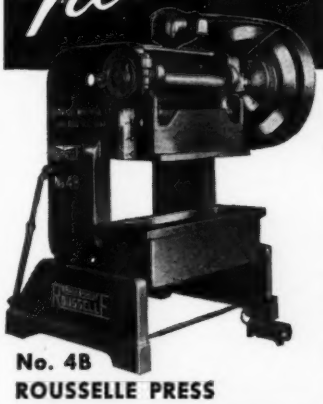

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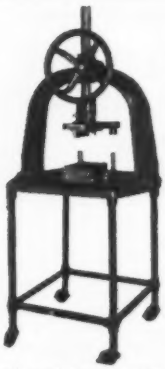

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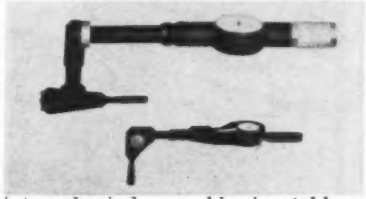

internal grinders, and horizontal boring mills. Sizes range from ⅜" to 6⅛". Write Standard Gage Co., Inc., Poughkeepsie, N. Y., or — **No. A120.**

A New Gear Inspection-Recording Unit automatically checks gears for size and helix angle accuracy, rejects out-of-tolerance parts, and makes a chart record of the measurements.

The Red Ring unit automatically feeds gears one at a time into gaging position. Get information from National Broach & Machine Co., 5600 St. Jean, Detroit 13, or — **No. A121.**

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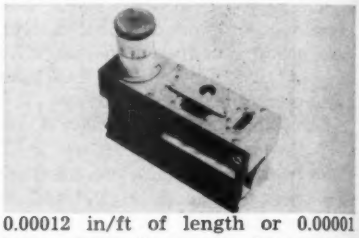
from 0 to 8", in flat and parallel anvil or spherical upper anvil types. Indicator is graduated in 0.0001". Boice Gages, Inc., Hyde Park, N. Y., or — **Circle Inform-A-Gram No. A122.**

An Optical Level measures flatness, straightness, and parallelism based on the principle of observation of three bubble-phials located in the hinged top of the instrument. Deviations from the horizontal of



0.00012 in/ft of length or 0.00001 in/in of length can be determined. Get information from the F. T. Griswold Mfg. Co., 315 W. Lancaster Ave., Wayne, Pa., or — **No. A123.**

Two Jones & Lamson Comparators

This New 14" Optical Section Comparator was developed to inspect the contours of blade edges and the fairing between edge contour and foil contour. Its two high intensity illuminating units produce collimated light, and the manually-operated blade orienting fixture allows the edge contour to be inspected along its entire blade length. Jones & Lamson Machine Co., Springfield, Vt., or—**Circle Inform-A-Gram No. A124.**

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Request Catalog S-43 Write **THE SENTRY CO., FOXBORO, MASS.**

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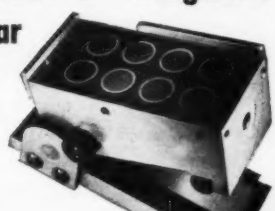

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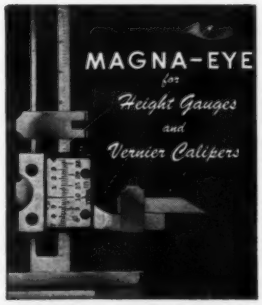

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Precision Manufacturer of H.S.S. and Carbide Rotary Cutters Carbide End Mills • Special Tools

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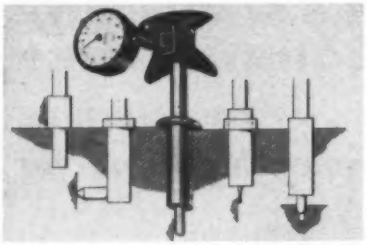
A Line of Precision Concentricity Gages checks hole location, alignment, and concentricity, or explores tapered holes. Styles offered include gage with pilot ahead or behind gaging point, gage for checking run-out of a center and an outside diameter, or gage with a pilot diameter smaller than the hole to be checked. Write Zero Internal Gage Co., 11360 Schaefer Hwy., Detroit 27, for information, or — **Circle No. A126.**



A Direct-Reading Optical Gage measures depth, thickness, height, and diameter and has a continuous range from 0" to 3", with no masters or set gages needed. Most parts can be laid on the avil of Model DR-25 for measurement, but an extra-large worktable makes it easy to adapt special fixtures. It's accurate to 0.000025". Bausch & Lomb Optical Co., 77349 St. Paul St., Rochester 2, N. Y., or — **Circle No. A127.**

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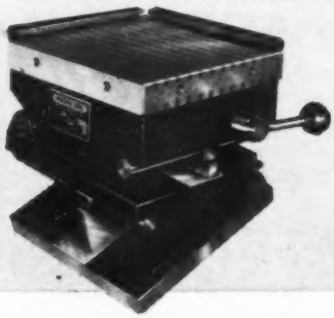
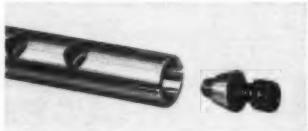
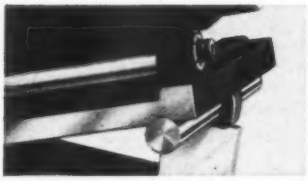


Only Robbins angular tooling equipment assures you positive accuracy when setting up to machine, grind or inspect angular work . . . because only Robbins gives you these exclusive features:

POSITIVE LOCKING locks firmly inside sine bar roll with expanding action for positive lock. Screw at each end locks toward front of unit, always pulls upper member firmly down on gage block without distortion. (Pat. app. for)





"PERMA-FLAT" SWIVEL BLOCK contacts gage block over entire face of swivel block instead of on a single thin line of contact. This patented feature provides greater contact between gage block and unit . . . combines with Robbins positive locking to assure the utmost accuracy.

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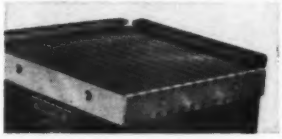

IN ADDITION, both magnetic and non-magnetic models are built with ribbed base, intermediate and top plates for distortion-free strength and rigidity, with full-length ground roll seats for precision location, greater accuracy. All models make it possible to set up any angular work in just four simple steps . . . in minutes instead of hours! Before you purchase any sine plate, be sure you check Robbins' exclusive features. Write for new catalog!

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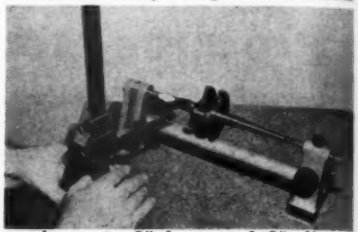
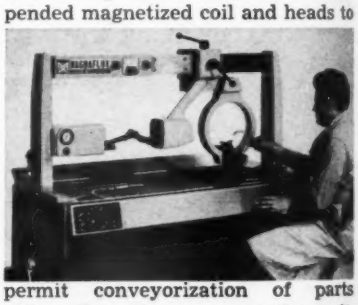


work up to 8" long and 3" dia on centers either horizontally or vertically. Bulletin ST-005 is available from the company, or — **No. A128.**

Speed, Versatility, and Efficiency are features of the new Magnaflux-Magnaglo testing unit for volumn inspection of small ferrous parts up to 24" long. Model NQ-242 has suspended magnetized coil and heads to



permit conveyorization of parts either through or across the unit. Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, or — **No. A129.**

Measure Any Machined Part with the 10" model size gage, with 0.00005" accuracy at any measuring point. Readings can be taken under or on top of the spacer. Get increased capacity using 3" and 6" riser blocks. Armour Machine Co., 700 Oak St., Copiague, N. Y., or — **Circle No. A130.**

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VERTICAL LIGHT BEAM
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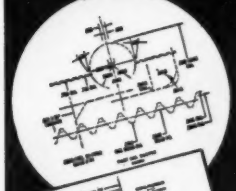

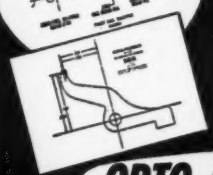

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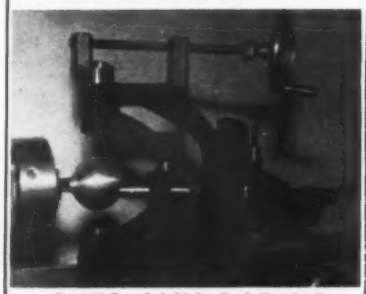
CIRCLE INFORM-A-GRAM KEY NO. 1514

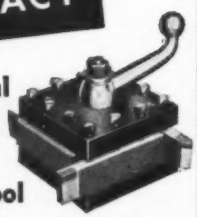
New **RADITURN** √



CUTS ANY RADIUS
Convex, Concave or Ball
Patented
The accurate short cut for turning any radius. Adaptable to most any lathe.
Contact your tool supplier or write for details.
RETCO MFG. & SALES
1458 E. CLINTON • FRANKFORT, IND.

CIRCLE INFORM-A-GRAM KEY NO. 1521

±.0005" ACCURACY



Here's Real Precision *Plus* Multiple Tool Efficiency

ENCO TOOL POST TURRETS

Boost lathe production, cut costs, reduce tool switching and re-checking, cut set-up time, with ENCO 12-station tool post turrets! Holds 4 maximum size tools . . . . 3 working positions each. Sturdy and rigid for hogging cuts, yet unsurpassed for close-tolerance work.

ON-THE-BALL RE-INDEXING

Spring loaded balls locked between perfectly milled spherical seats provide consistent re-indexing accuracy. "On the ball" every time!

There's an ENCO turret for every lathe.

Mail coupon for cat. #53 and name of nearest Enco Franchise Dealer.

ENCO Mfg. Co.
4520 W. Fullerton
Chicago 39

PRECISION ENCO ECONOMY

ENCO Manufacturing Co.
4520 W. Fullerton,
Chicago 39, Dept. 798

Please send catalog #53 and full details of ENCO 12-station tool post turrets.

Name_____

Firm_____

Address_____

CIRCLE INFORM-A-GRAM KEY NO. 1522

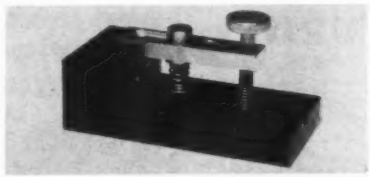
Toolroom

PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS&PROCESSES&PRODUCTS

Shape Dies and Tools to dimension faster and more accurately without hand filing or other semi-finishing operations with this contour sawing and filing machine. It is for all sawing, filing, and lapping operations and comes in five bench or pedestal types. Oliver Instrument Co., 1470 E. Maumee Ave., Adrian, Mich., or **Circle No. A131.**

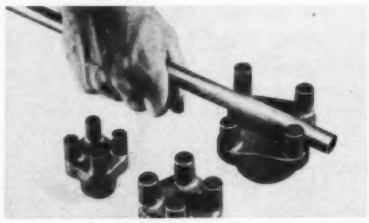
"Tracer-Controlled Pantograph Engraving Machines" for 2- and 3-dimensional production profiling; die, hob, and mold milling; or general engraving are discussed in a 28-page catalog. Dimensions as well as descriptions of standard and special equipment, are given for each machine. Get Catalog 1580-K from George Gorton Machine Co., Racine, Wis., or — **Circle No. A132.**

Unfinished Case Surfaces can be clamped by using a line of hardened stainless steel tool and fixture clamps which come in more than 12 different



sizes and two styles. Write for Catalog 16, available from PIC Design Corp., 477 Atlantic Ave., E. Rockaway, L. I., N. Y., or — **No. A133.**

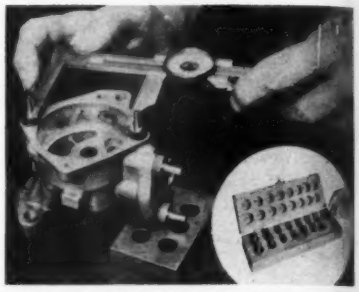
An Enlarged Line of Four-Prong Speed Bar Knobs features fast action with maximum clamping pressure. These bar knobs are made in 15 sizes and can easily be turned by hand or



with a bar or tool handle inserted between the prongs. Four have extra long prongs to be used with crank handles. Jergens Tool Specialty Co., 712 E. 163 St., Cleveland 10, or — **Circle Inform-A-Gram No. A134.**

"The Care and Use of Diamonds" gives a number of basic pointers on how to get more use and value out of diamonds. There is also a section showing detailed drawings of types of diamond grinding wheel dressers. For your booklet, write Standard Diamond Tool Corp., 71 W. 47th St., Nw York 36, N. Y., or — **No. A135.**

Simplify Inspection and Setup when checking dimensional accuracy of threaded hole centers by using Jo-Plugs. They consist of a threaded plug base and an upper spindle with



uniform 0.200" dia, which acts as a constant throughout the range of plug sizes. Spence Industries, 6910 Chase Rd., Dearborn, Mich., or — **Circle Inform-A-Gram No. A136.**

Automated Special Machine Tools for low, medium, and high production operations are divided into generic types and outlined according to production parts, operations, and rate schedules to which they are applicable, in a new bulletin. For details, get a catalog from Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, or — **Circle Inform-A-Gram No. A137.**

An Air Turbine Grinding Head gives uninterrupted precision grinding because the radial feed is adjustable without stopping the machine. Grind-A-Matic can be mounted on a jig borer, boring mill, lathe, etc., for

close tolerance tool room work on dies and fixtures, or production jobs. Holes from ⅛" to 2½" can be precision ground. Threadwell Tap & Die Co., Greenfield, Mass., or—**No. A138.**

Are your lathes designed to profit from throwaway insert tools?

PROFIT POINT TURNING

Real profits come from decreased tool-change downtime and increased machine speeds

You can take full advantage of the savings made possible by throwaway insert tooling — elimination of sharpening and resetting costs, and decreased tool-change downtime — if you have a modern, high-speed lathe designed for carbides and ceramics. Chances are savings in tool-replacement costs plus greater production due to higher speeds and increased rigidity will amount to thousands of dollars a year, enough to pay for the new lathes you need badly to take full profit advantage.

The use of conventional speeds with throwaway insert tools is *wasteful.* And your profits are pegged *low* if you're using them on 20-year-old lathes that are underpowered for high-velocity turning. With perishable-tool costs so low in comparison with the cost of operating a lathe, the only sensible thing to do is boost machine speeds . . . burn up the cutting tool faster . . . really trim the fat out of the part price.

The speed at which tool costs and machining costs are in balance is your PROFIT POINT (see example above). But to operate at the right speed you need power, precision, and rigidity in lathes used with throwaway insert tooling—advantages your company will be glad to pay for in order to save time, floor space, and cost.

In other words, why put throwaway insert tooling on a "throwaway profit" machine tool?

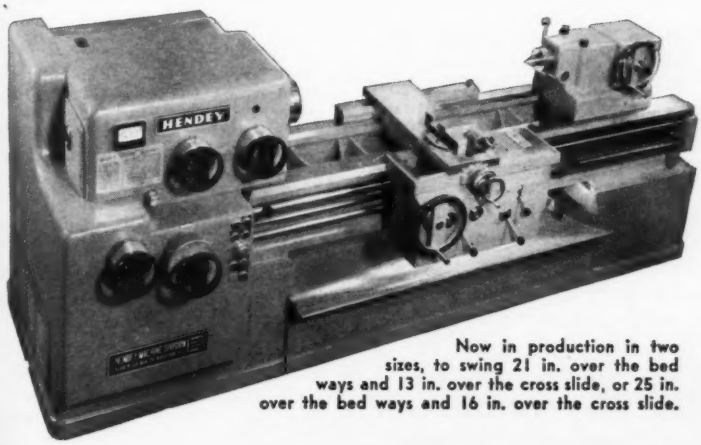
Example of PROFIT-POINT Turning		
Cost Item	Brazed Carbide	Throwaway Insert
Tool-change time	5 min.	2 min.
Cost per cutting edge	$1.27	$.25
Minimum cost tool life	40.4 min.	11 min.
Cutting speed for PROFIT-POINT turning	720 fpm 1000 rpm	980 fpm 1360 rpm
Machining time per piece	1 min.	.74 min.
Total time per piece (including nonproductive time per piece)	2 min.	1.74 min.
Machining cost per piece	$.15	$.11
Total cost per piece	$.031	$.017
Nonproductive cost per piece	$.15	$.15
Pieces machined per hour	30	34
TOTAL COST PER PIECE	$.331	$.278

Barber-Colman's new 36-speed lathe is designed for PROFIT-POINT turning

Here's the machine that will give you precision work at the high speeds required for PROFIT-POINT turning with throwaway insert tools!

Look at the cross girth of the bed, extra-heavy cross slide, and rugged tailstock. Consider that this lathe will pull up to 25 hp through the spindle and operate at speeds up to 2000 rpm — yet you can get toolroom accuracy. And all the toolroom features, too, including: (1) multiple-thread indexing spindle, (2) built-in thread-chasing dial, (3) 66 threads, from 2 to 120 per inch, (4) reverse lever on apron, (5) automatic micrometer stops, (6) ball-thread-chasing stop on cross-feed screw, (7) hardened and precision-ground cross-feed screw and compound screw, (8) automatic, filtered lubrication to half nuts.

There are 36 spindle speeds through the geared head and 66 feed and thread changes, selected easily through two dials on the headstock. Write for complete facts on how this new Barber-Colman precision lathe will pay for itself quickly with throwaway insert tooling.



Now in production in two sizes, to swing 21 in. over the bed ways and 13 in. over the cross slide, or 25 in. over the bed ways and 16 in. over the cross slide.

Barber-Colman Company
97 Loomis Street, Rockford, Illinois

Don't expect a day's work for a day's pay on yesterday's machine tools

BARBER COLMAN

PRECISION LATHES

CIRCLE INFORM-A-GRAM KEY NO. 153

CLAUSING COLCHESTER GEARED-HEAD LATHES

HERE'S PROOF OF PERFORMANCE *from Anderson Duggar, Jr., president of Equitable Engineering Co. — "How do we like our Clausing 15" geared-head lathe? We want another just like it! Our people really surveyed the market thoroughly before deciding on the Clausing — believe me, it's everything it looked to be and more. The Clausing is an extremely accurate lathe and its features and ease of operation are making us money."*

Clausing geared-head lathes do lead their field in capacity, performance and value. Here's why:

They're bigger in capacity than other lathes in their class. Larger spindles, larger thru-hole capacity, larger bearings for heavier work. 17" lathe spindle, for example, has 3-1/16" thru hole — 15" lathe, 2-1/16" hole — 13", 1-9/16" hole.

Have heavy-duty construction throughout. Bed ways are induction hardened. Gears in head and quick-change box run in bath of oil. Power feeds are taken from separate feed rod, lead screw is used for thread cutting only. Spindles are high-tensile steel.

Built for precision performance — to American standards of toolroom lathe accuracy. Have Gamet Micron tapered roller bearings with oil flow lubrication — the most advanced and accurate bearings known to industry.

Each is an outstanding value. 13" cabinet base models, including motor and controls, start at $2113; 15" cabinet base at $2988; 17" at $4715. You owe it to yourself to investigate before investing in *any* lathe.

Lathe Capacities: 17" lathe: 54" and 78" centers, 28" swing in gap; 15" lathe: 30" and 48" centers, 24" swing in gap; 13" lathe: 24" and 36" centers, 18" swing in gap.

CLAUSING DIVISION *Write for Free Literature* ATLAS PRESS COMPANY

9-115 N. Pitcher St. • KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 154

Plastics

PRODUCTS&PROCESSES&PRODUCTS&PROCESSES

A Liquid Adhesive, Chemlok 607, is used for bonding unvulcanized silicone and other synthetic elastomers to metals, fabrics, and plastics. It is especially useful for bonding fluorocarbon elastomeer, Viton A, to steel, copper, brass, aluminum, titanium, magnesium, and chrome-plated steel. The adhesive, said to provide excellent adhesion, is versatile for many applications where a superior bond is required. The bond strength of Chemlok 607 with Vitol A has been measured at temperatures ranging as high as 500°F. Contact Lord Mfg. Co., Special Products Div'n, 1635 W. 12th St., Erie, Pa., for more information, or — **Circle Inform-A-Gram No. E1.**

A Flexible Casting Resin which sets at room temperature is Maraset resin 639, described in a bulletin from Marblette Corp., 37-31 13th St., Long Island City 1, N. Y. This material produces flexible or hard castings. Odorless, dimensionally stable, with good chemical resistance and excellent recovery characteristics, it adheres firmly to plastics and metals. Write to the company for Technical Bulletin 639, or — **Circle No. E2.**

A 36-Page Booklet explains the six basic uses of Tenite polyethylene resins — molding, pipe, film, coating, blowing, wire, and cable covering. Features and advantages of coloring with the color concentrates and a detailed table of specifications show the range of properties offered by Tenite polyethylene. Eastman Chemical Products, Inc., Kingsport, Tenn., supplies copies of "Tenite Polyethylene," or—**Circle Inform-A-Gram No. E3.**

Materials, Products, and Equipment used for plastic tooling are described in various bulletins contained in a folder. Information is included on Hysol tooling compounds and eight hardeners. Write to Houghton Laboratories, Inc., 222 Houghton Ave., Olean, N. Y., for your folder, or—**Circle Inform-A-Gram No. E4.**

Materials for Fibrous Glass Reinforced Plastics are listed in a 16-page catalog from Cadillac Plastic & Chemical Co., 15111 2nd Ave., Detroit 3. Included are complete ranges of fiber glass fabrics and fibers, polyester and epoxy resins, catalysts, parting agents, and pigments. Available sizes, grades, and prices and descriptions of properties and recommended applications are included. Write the company for Catalog 2, or — **Circle No. E5.**

Save machining

with AMPCO® METAL Stock Bars

Typical bushings and bearings of Ampco Metal centrifugally-cast bars.

Only finish-machine cuts are needed on Ampco Metal Centrifugally Cast Stock Bars. They are semi-finish machined all over — finish allowance, 1/16" on O. D. and I. D.

Made of Ampco Metal Grade 18, a tough copper-base alloy that resists wear, shock, impact. Ideal for bearings, bushings, gears, and similar applications.

Your Ampco distributor has Ampco Metal Stock Bars in stock now — in 90 sizes up to 10" O. D. 12½" lengths. Call him for prompt delivery. *Ampco Metal, Inc., Dept. 541, Milwaukee 46, Wis. West Coast plant: Burbank, Calif. — Southwest plant: Garland (Dallas County), Texas.*

RM-11

AMPCO

AMPCO®

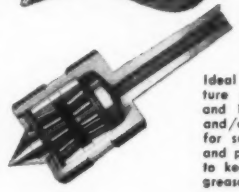
CIRCLE INFORM-A-GRAM KEY NO. 155

IDEAL GOLD BAND

LIVE CENTERS

GUARANTEED TO MATCH OR EXCEED, "CRITICAL" JOB SPECIFICATIONS

In the GOLD BAND line Ideal has combined the latest production methods with their traditionally fine craftsmanship to bring you an unequalled standard of excellence in live centers. Accurate, (to ± .0001") GOLD BAND Live Centers offer "custom" quality at production prices. Specify GOLD BAND Live Centers and your every need can be accommodated from stock . . . 99 times out of 100. Ideal's GOLD BAND Live Centers offer savings, simplified operations and higher lathe output both in quantity and quality. Contact your distributor today...or



PRECISION FITTED BEARINGS

Ideal Live Centers feature precision machined and hardened ball and/or roller bearings for superior accuracy and performance. Sealed to keep dirt out, grease in.

A COMPLETE LINE FOR EVERY NEED...SPECIALS, TOO!

Send for
Complete catalog data and specifications.

IDEAL INDUSTRIES, Inc.
1334-1 Park Ave., Sycamore, Ill.
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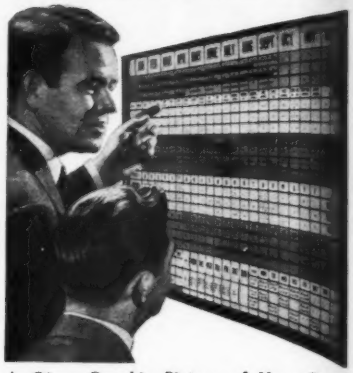
You Get Things Done With Boardmaster Visual Control



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ALINA BORE TEST

High Precision Small Bore Gage
Dial Graduated to Read .0001"

Indicates taper, bell mouth, out-of-round and other dimensional variations of bores ranging in size from .057" thru .810". ■ Simple design and rugged construction are combined to provide a reliable instrument that will always repeat. ■ 3 sets cover complete range; each set fully equipped with rings and measuring heads. ■ 2 different holders are available for production applications.

ALINA WRITE FOR LITERATURE

ALINA CORPORATION
122 East Second St., Mineola, L.I., N.Y.

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QUALITY Depends on ACCURATE INSPECTION

Accuracy of measurement depends on the precision of the measuring tools. Provide your Shop and Inspection Department with dependable and proper inspection tools. MEEHANITE METAL TOOLS, made to close tolerances, are furnished in many types.

Surface Plates—Box Parallels—Slotted Angle Plates—Universal Right Angles—Flat Parallels—Lapping Plates—Toolmaker's Knees—"V" Blocks—Straight Edges (Bridge Type)—Straight Edges (Leveling Type)—Measuring Irons—Masterangle Plates—Angle Attachments

SURFACE PLATES RESCRAPED

ACME TOOL CO.
75 W. Broadway, New York 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1564

"Diamond Wheels and Hones" is a 20-page catalog that lists standard wheel sizes and shapes, diamond depths and concentrations, and grain and grade specifications of resinoid and vitrified bonded wheels made from man-made diamonds. The metal bonded wheels listed are furnished with natural diamonds, and the resinoid and vitrified bonded wheels may also be supplied with natural diamonds. Get Catalog ESA-290 from Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, or — **Circle Inform-A-Gram No. E6.**

"Work-Holding Devices" lists a complete range of workholders from adapters through vises, including angle tables, arbors, chucks, and magnetic chucks. Specifications, along with some detailed drawings, are given for these items. Get your 24-page catalog from De Witt Equipment Corp., 190 Elizabeth Ave., Newark 8, N. J., or — **Circle Inform-A-Gram No. E7.**

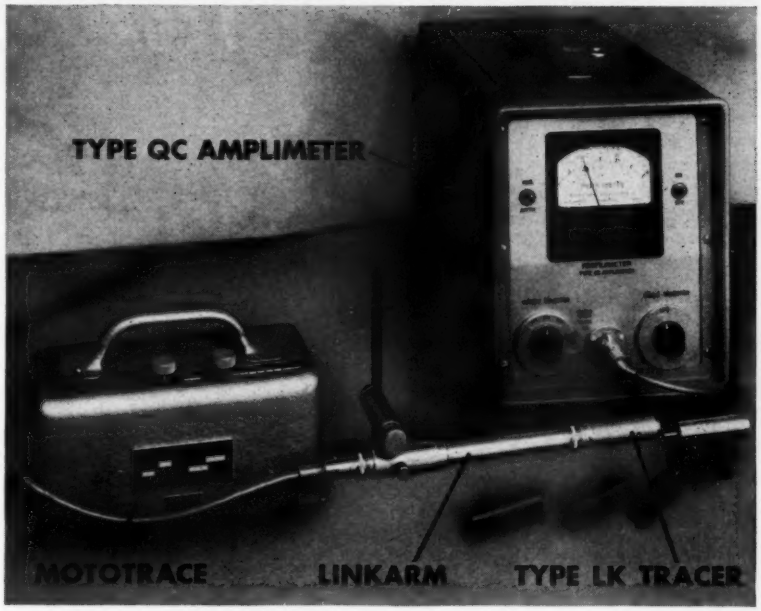
"Interchangeable Punches and Dies," a 60-page catalog, contains dimensional data on light- and heavy-duty punches, die buttons, retainers, dowel pins, and die springs. Detailed diagrams are presented for each item. A price list is included with Catalog HH, available from Richard Bros. Punch Div'n, Allied Products Corp., 26500 Capitol Ave., Detroit 39, or — **Circle No. E8.**

Collet Index Fixtures for tool room and production work by Hardinge Bros., Inc., 14200 College Ave., Elmira, N. Y., hold work accurately and provide rapid and economical indexing. Units are interchangeable for a variety of applications, including use on sub-bases on milling machines, grinders, shapers, and drill presses. Bulletin CIF is available from the company, or — **No. E9.**

For Polishing Plastic Molds and lapping carbide, use Tetrabor paste, a lapping compound which has over 80% of diamond hardness and great pressure resistance. The abrasive can be used for lapping carbide dies and blanks, gages and holes in die work, die faces, and cutting edges. For information, write Titan Tool Supply Co., Inc., 1419 Hertel Ave., Buffalo 16, N. Y., or — **No. E10.**

BUY U.S. SAVINGS BONDS

NEW! Profilometer® GROUP III



Measures Roughness of Surfaces from 1/8" to Flat — ID and OD

THIS shop equipment handles an exceptionally wide range of roughness measurement—with *proven Profilometer accuracy.* It is lightweight and portable — built for use by shop personnel — and includes the following items:

NEW Type LK Tracer — Measures on ID's and OD's as small as 1/8" — flats — tapers — narrow splines — gear teeth. Passes through a 3/4" hole.

NEW Type QC Amplimeter — Shows roughness from 0 to 1000 microinches (arithmetical or r.m.s.) on an easy-to-read meter. Has 3 standard roughness width cutoffs. Factory-calibrated for dependability.

Mototrace and Linkarm — Give the Tracer a steady support and smooth motion, essential to dependable measurement. No operator skill required.

FREE LITERATURE gives details. Write for it. And, without obligation, let us arrange for a demonstration in your plant. We have representatives in principal industrial centers throughout the Free World.

Remember: You can DEPEND on the PROFILOMETER — first in surface roughness measurement since 1936.

Profilometer is a registered trade-mark.

MMC® MICROMETRICAL MANUFACTURING COMPANY

339 S. MAIN ST. ANN ARBOR, MICHIGAN
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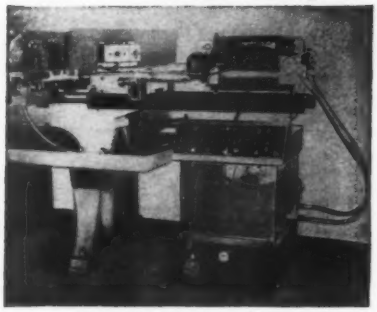
ACME HYDRIVE

increases production up to **100%**



. . . and makes a hand operated turret lathe dependably automatic.

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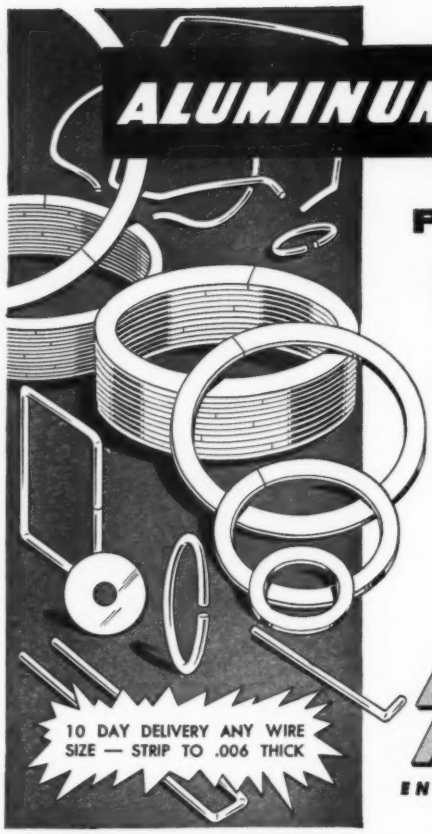
206 No. Laflin St. • Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1581

ALUMINUM *Brazing?*



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PREFORMS

In Sizes And Shapes To Do Your Brazing Job Better

1 **NOTCH COIL RINGS**-No Tangling Problems
2 **EDGEWOUND WASHERS**-No Blanking Scrap Losses
3 **BLANKED WASHERS**-Close Tolerance From Thin Sheet
4 **SPECIAL SHAPES**-Rectangles, Ovals, U-clips, Segments and Many Others

AVAILABLE IN THESE ALCOA ALLOYS
718 Brazing Wire and Sheet
716 Brazing Wire
713 Brazing Sheet

LUCAS MILHAUPT
ENGINEERING COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 1582

most VERSATILE PIN GAGES *made!*

Horberg exclusive taper feature lets you check undersize, oversize and odd-size holes, slots, etc., quickly and accurately with standard letter, number or fractional size gages.

A precision concentric taper on the lower half of each gage runs to 0.0012" smaller than gage size. You get a continuously accurate range of measurement with each gage, for quicker, handier, precision gaging in set-up, machining, tooling and inspection operations.

SPECIFICATIONS
Diameter accurate to +0.0001" —0.0000"
Standard 1.5" length
Concentric taper on lower half to .0012" smaller size
Oil hardened tool steel

PRICES AND ORDER FORM (F.O.B. Bridgeport, Conn.)

____ Letter sets—52 gages A-Z in pairs $65.00
____ Fraction sets—60 gages 3/64" to 1/2" in pairs $75.00
____ Number sets—120 gages 1-60 in pairs $130.00
____ Single gages____ size ea. $1.50

Sets furnished in indexed plastic case. Extra case $15.00
Prices subject to change without notice.

Please rush items checked to:

Name_____
Company_____
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JIG BORING
and
Large Precision Machining

Done to your specifications
We Have
22 Jig Borers
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1584

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ALL TYPES MADE TO YOUR SPECS

Dr. Chas. Eisler ME, Founder
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CIRCLE INFORM-A-GRAM KEY NO. 1585

THE INFORM-A-GRAM CARD FOLLOWS PAGE 98 IN THIS ISSUE

Management

PRODUCTS&PROCESSES&PRODUCTS&PROCESSES

"Graphical Presentation with the Univac 120 Punched-Card Electronic Computer" is a 26-page booklet which tells how a graphical presentation helps to observe trends and variations in a particular set of data. An explanation of how the system works and some graphs are included. For your copy of Manual U-1471, write to Remington Rand Div'n, Sperry Rand Corp., 315 4th Ave., New York 10, or —

Circle Inform-A-Gram No. F1.

"The Filmsort Aperture Card for Your Engineering Drawings and Allied Records" gives a step-by-step explanation of the Filmsort System. It traces the basic procedures in transforming an original engineering drawing to a frame of microfilm, inserting the film into an aperture card, viewing and enlarging the film from the card, and the use of new techniques. Contact The Filmsort Co., Pearl River, N. Y., for your copy, or

Circle Inform-A-Gram No. F2.

Get New Management Ideas from a folder which contains several types of bulletins: "Management Information" for foremen and supervisors discusses current problems, "Management Skill Study" is devoted to areas of self-improvement, and "Databooks" assist supervisors in more effective planning. The folder, "New Horizons for Supervision" can be obtained from Elliott Service Co., Inc., 30 N. MacQuesten Pky, Mt. Vernon, N. Y., or —

Circle Inform-A-Gram No. F3.

A Fireproof and Burglar-Proof File is now available from Charles Bruning Co., Inc., 1800 W. Central Rd., Mt. Prospect, Ill. Valuable drawings and maps as large as 31" x 42" can be protected from fire and theft without the necessity of building a vault or purchasing a large safe. For information, write to the company, or —

Circle Inform-A-Gram No. F4.

High Speed Whiteprinters have been introduced by Paragon-Revolute Corp., 77 South Ave., Rochester 4, N. Y. These models have either a 100 or 150 watt lamp and speeds up to 75 ft/min, a revised cooling system which assures lower cylinder temperatures, and increased developing capacity. Write to the company for more information, or —

Circle Inform-A-Gram No. F5.

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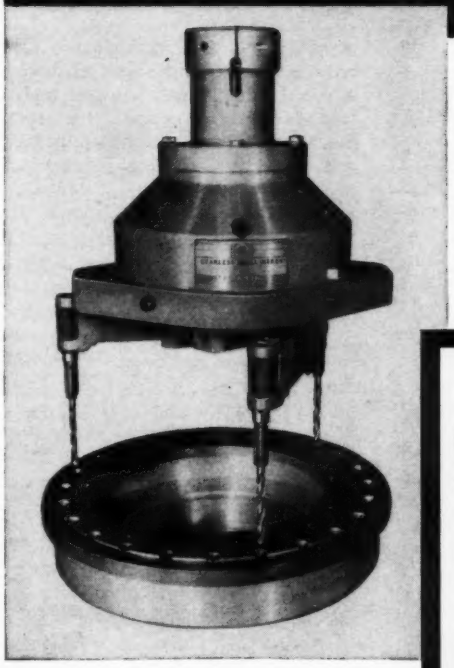

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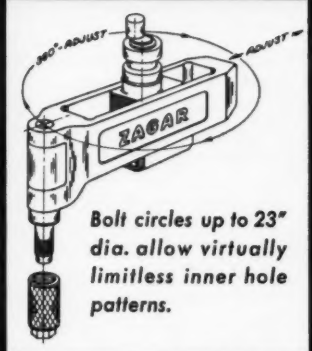

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CIRCLE INFORM-A-GRAM KEY NO. 159

SMALL SCREWS
their Standardization, Production and Measurement

by P. R. Brierley, B. Sc.
Director
ANGLO-SWISS SCREW CO., LTD.
England

We thank the editors of Industrial Fasteners Institute's "Fasteners" for permission to present this feature—EWP

NOT MANY YEARS AGO, only the watch and clock makers and a few instrument makers were concerned with screws that were smaller than 3-mm. or ⅛" dia. Today, however, owing to the wider use of scientific equipment and the trend towards miniaturization, the standardization, production and measurement of small screws are of considerable importance, and especially international standardization. At present, the national and international systems of small screw threads are as follows:

(1) The B. A. series with a thread angle of 47½ degrees;
(2) The small sizes of the British Whitworth Coarse series (55 deg.);
(3) Unified and American UNC, NC and NF numbered series (60 deg.);
(4) German DIN metric series (ISA form, 60 deg.);
(5) French metric series (ISA form, 60 deg. but 50 deg. below 1 mm dia.);
(6) ISA-B metric fine series (ISA form, 60 deg.);
(7) German DIN fine metric series (ISA form, 60 deg.);
(8) Swiss NHS 56100 metric series (60 and 50 deg.);
(9) American Elgin inch series of watch-screw threads (60 deg.);
(10) ISO metric series (60 deg.).

A comparison of these systems as regards diameter and pitch is set out in the table. It will be observed that between some series the differences are small, and are often confined to angle. For example, for 10 B.A. and 1.70-mm. NHS the major diameter and pitch are identical, but the angle is different. Again, for 3-56 NF and 2.5-mm. French metric, the angle is 60 deg. and the major diameter and pitch are nearly alike.

As regards the use of screws in watches and clocks, the practice in the various countries appears to be as follows: In the United Kingdom and the British Commonwealth, except Canada, B.A. threads are used only in clocks and ships' chronometers. Unified, American and Metric threads are also used for these mechanisms. For watches, only NHS and American (Elgin) threads are used.

In the U.S.A. and Canada, the trend is to use only Unified and American threads in clock manufacture. For watches some companies use the Elgin, some the NHS 60-deg. and 50-deg. threads, and others the 60-deg. metric threads.

In Europe, outside Switzerland and the British Isles, the various national

COMPARISON OF SMALL SCREW-THREAD SYSTEMS

Diameter		Pitch, mm.										
In.	Mm.	B.A.	Whit.	UNC & NC	NF	Elgin	DIN	French	ISA-B fine	DIN fine	NHS	ISO
0·112	2·84	—	—	0·63	0·53	—	—	—	—	—	—	—
—	2·80	0·53	—	—	—	—	—	—	—	—	—	—
—	2·60	—	—	—	—	—	0·45	—	0·35	0·20 0·25 0·35	—	—
0·099	2·52	—	—	0·53	0·45	—	—	—	—	—	—	—
—	2·50	0·48	—	—	—	—	—	0·45	—	—	—	0·45
3/32	2·38	—	0·53	—	—	—	—	—	—	—	—	—
—	2·30	—	—	—	—	—	0·40	—	0·25	0·20 0·25 0·35	—	—
—	2·20	0·43	—	—	—	—	—	0·45	—	—	—	0·45
0·086	2·19	—	—	0·45	0·40	—	—	—	—	—	—	—
—	2·00	—	—	—	—	—	0·40	0·40	0·25	0·20 0·25 0·35	0·40	0·40
—	1·90	0·39	—	—	—	—	—	—	—	—	—	—
0·073	1·85	—	—	0·40	0·35	—	—	—	—	—	—	—
—	1·80	—	—	—	—	—	—	0·40	—	—	0·35	0·35
—	1·70	0·35	—	—	—	—	0·35	—	0·20	0·20 0·25	0·35	—
—	1·60	—	—	—	—	—	—	0·30	—	—	0·35	0·35
1/16	1·59	—	0·42	—	—	—	—	—	—	—	—	—
0·060	1·52	—	—	—	0·32	0·23	—	—	—	—	—	—
—	1·50	0·31	—	—	—	—	—	—	—	—	0·30	—
—	1·40	—	—	—	—	—	0·30	0·30	0·20	0·20 0·25	0·30	0·30
0·055	1·37	—	—	—	—	0·14	—	—	—	—	—	—
—	1·30	0·28	—	—	—	—	—	—	—	0·25	0·30	—
0·049	1·22	—	—	—	—	0·18 0·13	—	—	—	—	—	—
—	1·20	0·25	—	—	—	—	0·25	0·25	0·20	0·20	0·25	0·25
0·047	1·17	—	—	—	—	0·23	—	—	—	—	—	—
0·045	1·12	—	—	—	—	0·23	—	—	—	—	—	—
—	1·10	—	—	—	—	—	—	—	—	—	0·25	0·25
0·043	1·07	—	—	—	—	0·21	—	—	—	—	—	—
0·041	1·02	—	—	—	—	0·19	—	—	—	—	—	—
—	1·00	0·23	—	—	—	—	0·25	0·25	0·20	0·20	0·25	0·25
0·037	0·92	—	—	—	—	0·18 0·12	—	—	—	—	—	—
—	0·90	0·21	—	—	—	—	0·225	0·20	—	—	0·225	0·225
—	0·80	—	—	—	—	—	0·20	0·20	—	—	0·20	0·20
—	0·79	0·19	—	—	—	—	—	—	—	—	—	—
0·031	0·77	—	—	—	—	0·14 0·12	—	—	—	—	—	—
0·029	0·72	—	—	—	—	0·12	—	—	—	—	—	—
—	0·70	0·17	—	—	—	—	0·175	0·15	—	—	0·175	0·175
0·027	0·67	—	—	—	—	0·14	—	—	—	—	—	—
0·025	0·62	0·15	—	—	—	0·12	—	—	—	—	—	—
—	0·60	—	—	—	—	—	0·15	0·15	—	—	0·15	0·15
0·023	0·57	—	—	—	—	0·10	—	—	—	—	—	—
—	0·55	—	—	—	—	—	—	0·125	—	—	0·125	0·125
0·021	0·52	—	—	—	—	0·12	—	—	—	—	—	—
—	0·54	0·14	—	—	—	—	—	—	—	—	—	—
—	0·50	—	—	—	—	—	0·125	0·125	—	—	0·125	0·125
—	0·48	0·12	—	—	—	—	—	—	—	—	—	—
—	0·45	—	—	—	—	—	—	0·10	—	—	0·10	0·10
0·017	0·42	0·11	—	—	—	0·10	—	—	—	—	—	—
—	0·40	—	—	—	—	—	0·10	0·10	—	—	0·10	0·10
0·015	0·37	0·10	—	—	—	0·08	—	—	—	—	—	—
—	0·35	—	—	—	—	—	—	0·075	—	—	0·075	0·09
0·013	0·33	0·09	—	—	—	0·07	—	—	—	—	—	—
—	0·30	—	—	—	—	—	0·075	0·075	—	—	0·075	0·08
—	0·29	0·08	—	—	—	—	—	—	—	—	—	—
—	0·25	0·07	—	—	—	—	—	—	—	—	—	0·075

ordinary metric series, and the NHS series, are used almost exclusively, except by those manufacturers with an American background. The ISA-B and DIN fine series find little application.

In Switzerland, which is the largest producer of watches in the world, about 1,000 million watch screws are made every year. It might be thought that most of these would have the NHS 56100 thread with 60-deg. angle from 2- to 1-mm. dia., and with 50-deg. below 1-mm. dia. In practice, the majority are made with a 60-deg. angle, even below 1-mm. dia., in spite of the extremely narrow root.

After the war, the old International Standards Association was superseded by the International Organization for Standardization (ISO). The ISO adopted the Unified thread profile in place of the old S.I. profile, which, like the former American thread, was inadequately truncated at the root. ISO has now adopted a series of millimeter diameters and pitches with this Unified-ISO profile, the smaller sizes of which are shown in the table.

It will thus be apparent that there is considerable confusion as regards standard threads below 3-mm. dia., with 54 diameters associated with 33 pitches in 10 series. However, the work which the ISO Screw Thread Committee has done during the past few years to produce one series of 20 diameters and pitches in this range may eventually improve the position. For example, the Swiss watch industry has already tentatively adopted the ISO series with the Unified-ISO profile from 2-mm. dia. downwards, a decision based on tests indicating that there were considerable production gains with the new profile. In addition, these tests influenced to a considerable extent the ISO decision to adopt the 60-deg. Unified profile for screws between 1-mm. and 0.25-mm. dia. In accordance with an American-British-Canadian (ABC) agreement of 1955, the U.S.A. has already drafted a standard for miniature screw threads comprising the ISO sizes of 1.4-mm. dia. and smaller, and similar standards are due to be drafted by Britain and Canada. All the ISO member countries have now approved the ISO series in principle, so that, for the miniature sizes of 1.4-mm. and smaller, world standardization is apparently about to be achieved.

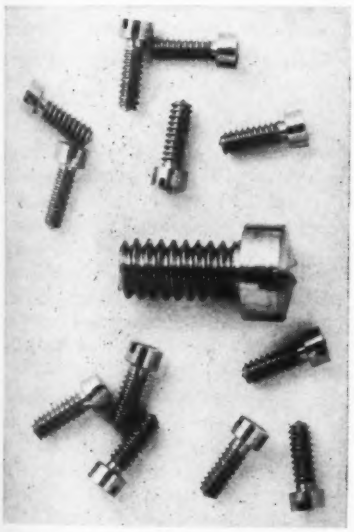


Fig. 1. Miniature fillister head screws of 0.60-mm (approx. 0.024") thread diameter are compared with the smallest of the machine screw series No. 0-80.

At the same time it should be borne in mind that even if the British Standards Institution should publish the complete ISO series as a British Standard for metric threads, above 1.5-mm. dia., B. A. and American threads would certainly continue to be used. Similarly, the U.S.A. will undoubtedly retain the ANF and ANC series, but in course of time some of these existing British and American threads may wither away.

Production

The problems associated with the production and inspection of small screws in the horological range are somewhat different from those encountered in connection with the larger screws used in other branches of engineering. In 1950, the ISO collected from England, the U. S. A., and Switzerland samples of small screws with both cut and rolled threads, and made nominally to 47½-, 55- and 60-deg. profiles, and it was found that it was not always possible to identify a screw thread from an examination of its profile only. Thus a screw may appear to be metric when it is actually Whitworth.

The truncations and shapes of the crests and roots of the threads are of less apparent significance than the angles, but with small screw threads they are probably of greater practical importance, since they affect ease of tool-making, tool life, and the torsional strength of screws and taps.

It must be realized that even on a 2-mm. dia. screw, the length of thread flank and the crest and root width are measured in hundredths of a millimeter. For 0.25-mm. dia. the flank length is about 0.05-mm., and the crest and root are 0.02- to 0.01-mm. wide. It is difficult to achieve true form when the dimensions are so small, and it is almost impossible to measure the form which is actually produced on the finished screw.

On the other hand, it may be concluded that so long as diameter, pitch, and crest and root formation are reasonably good, variations from true form are not of very great importance.

For screws down to 1.5-mm. dia., production methods are usually conventional. Such screws may be cold-forged, and the threads rolled between flat dies at a rate of about 200 per min. on hopper-fed machines. Where the higher cost is no objection, the superior finish of screws turned from the bar, with die-cut threads, may be preferred. On high-speed automatic lathes, output rates for these screws are about 60/min. in brass, and 20/min. in steel. Both fixed- and sliding-headstock type machines are employed.

Button or acorn dies are mainly used for cutting screw threads of 3- to 1.5-mm. dia., the acorn type being favored in America. Self-opening or fixed die heads are also used, especially for tough materials.

Thread-rolling attachments with circular rolls are used for threading behind shoulders on automatics and capstan lathes, and where threading is carried out as a secondary operation, either flat or circular dies may be used.

Below 1.5-mm. dia., less conventional production methods are employed. Such screws are invariably made on automatic lathes, usually of the Swiss type, with sliding headstock and differential screwing tailstock, but sometimes of the fixed-headstock type, or a special type with lead-screw die control.

Small acorn or button cutting dies may be used, but the Swiss and some other producers make the majority of these small screws with forcing dies, by a process akin to thread rolling. The shank size of the screw blank is made approximately equal to the pitch or effective diameter, and the forcing die, which is a very hard disc with a tapped hole in it, is pushed onto the shank. Material is thus squeezed into the roots of the die thread and during the operation the shank is subjected to considerable torsional deformation.

It is possible to obtain a better thread with expensive cutting dies than with forcing dies, but the latter are cheap and produce acceptable results, which, indeed, are superior to those achieved with most cutting dies. During the formation of a

thread in a forcing die, a fissure appears in one flank, which should have closed before the thread is finished, but in practice may remain slightly open.

Small holes, for example in the back plates of watches, are sometimes threaded with the tap equivalent of a forcing die. The hole is drilled to approximately the pitch diameter of the thread, and a non-cutting tap is forced into it to produce a thread with a minor diameter about 0.02 mm. less than that of the hole.

Taps for this purpose may be cut with dies, or may be rolled on special small thread-rolling machines.

The master taps used for making forcing dies may be rolled, cut with a single-point tool on an automatic leadscrew lathe, or, for the highest accuracy, for pitches down to about 0.15-mm. or even smaller, may be ground with diamond-dressed wheels on miniature thread grinders. Such thread grinders were first made in the United Kingdom, and have now been introduced in the U. S. A.

Inspection

As in the case of production, more or less conventional methods of inspection may be used for sizes down to about 1.5-mm. dia., but it becomes increasingly important to bear in mind their fundamental limitations. As an example, consider the effective-diameter tolerance for a 0.80 NF-2B nut, which has a diameter of 1.52-mm. and a pitch of 0.32-mm. According to ASA B1.1-1949, this tolerance is 0.058-mm. In theory, this means that the effective diameter of a nut of perfect form may be anywhere between two limits defined by the tolerance. If the nut has pitch and angle errors, however, the effective diameter may be anywhere between the minimum-metal limit and some size larger than the maximum-metal limit depending on the magnitude of those errors.

In practice, "go" and "not-go" gauges are used, the sizes and tolerances of which, for the thread in question, are laid down in ASA B1.2-1951, and their tolerances give rise to uncertainties. Moreover, in determining the sizes of the gauges, errors of measurement inevitably occur, so that further uncertainties are introduced. In addition, there is yet another uncertainty because there must be a small clearance between the nut and the gauge when they are screwed together.

Again, the "not-go" gauge, which in theory should make point contact at the theoretical pitch line, must, in practice, have a flank of some finite length, which must be sufficient to give a reasonable period of service. With small threads, this length must be a substantial proportion of the full-form flank length. Because, in practice, nuts have quite pronounced errors of form, and the angle towards the major diameter is usually too large, such practical "not-go" gauges will not enter nuts that are substantially oversize on diameter at the pitch line, and the nuts will be passed as correct.

Taking all these uncertainties into account, it is found that the theoretical tolerance of 0.0578-mm., for the example considered, is, in practice, more nearly 0.090-mm.

It seems reasonable to assume that this zone of uncertainty is somewhere between 0.015- and 0.030-mm. for all small threads, so that for the smallest sizes it may represent an even greater proportion of the tolerance and might even be comparable with the depth of the thread.

The magnitude of the zone of uncertainty depends upon the measuring equipment, upon the gauge tolerances and their disposition, and upon the design of the gauges and the manner in which they are used. It should also be pointed out that the measurement of a product thread with wires may yield misleading results as compared with those obtained with gauges.

It is not sufficient, therefore, merely to establish a system of tolerances. The tolerances form the basis for the gauges which, in turn, must be standardized not only as regards tolerance but in design and method of application. Moreover the conditions and methods of measurement of the gauges must be identical.

Practical experience has shown that gauges for the minimum-metal condition are of progressively less value as the size of the thread is reduced.

For these reasons, and because a solution has not yet been found for the problem of limits and fits for very small plain holes and shafts, the ISO Screw Thread Committee has decided that, for the present, no attempt will be made to formulate tolerances for screw threads below 1.5-mm.

Skill must be intelligently and conscientiously applied if a small screw thread is to be successfully produced. The master taps for the dies, the taps for the nut threads, and samples of the finished screws must be kept under constant supervision by projection of form. Measurement or gauging of screw blank diameters, and the major and pitch diameters of taps, must be carried out to ensure that they are kept as close as possible to the required dimensions.

Always, however, the limitations of the equipment and the gauges in use must be borne in mind, and it is not possible to be dogmatic even if it appears that the maximum-metal conditions have been exceeded. The zone of uncertainty, to which reference has been made, is an important factor even at the maximum-metal limit. end

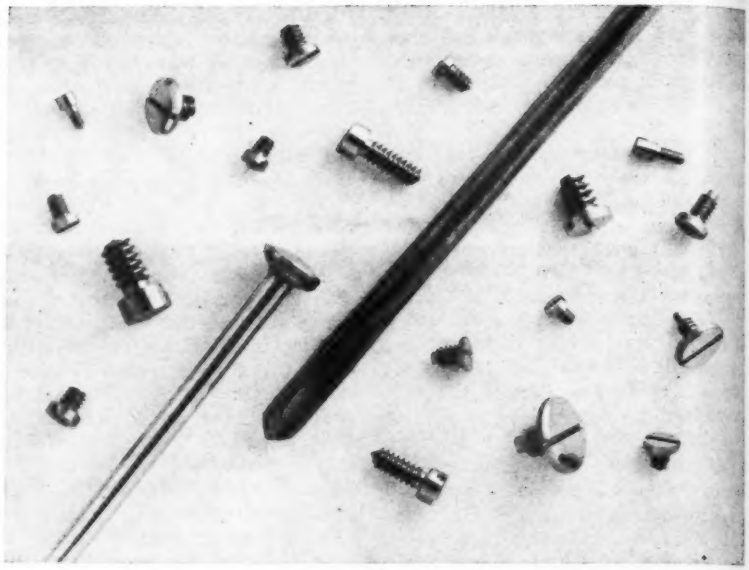
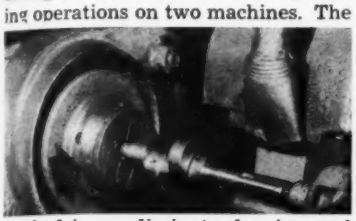


Fig. 2. An assortment of stainless steel watch screws compared with a common pin and an ordinary sewing needle.

SELF-CENTERING WORK DRIVERS CUT DIRECT LABOR COSTS

Grinding the motor end and main bearing of crankshafts used on Carrier Corporation's hermetic compresors is performed on two cylindrical grinders. Use of Seneca Falls Machine Company's work drivers (arrow) on both grinders has reduced Carrier's direct labor costs by enabling one operator to handle grinding operations on two machines. The



work drivers eliminate dogging and save 6 sec/pc on an 18 sec machine cycle. These work drivers are self-centering, quick, and positive. Serrated jaws tighten automatically on the work — the harder the pull, the tighter the grip. Work drivers may be used on any type of engine lathe, multiple tool lathe, and on plain or universal grinders for work diameters from ¼" to 6⅞".

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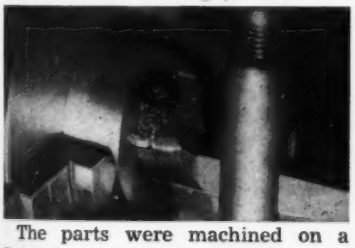

The parts were machined on a South Bend 13" lathe at 250-375 rpm, 125-135 sfpm. Feeds were 0.0035", depth of cut 0.010, and the final finishes 36-46 microinches rms. The part diameters ranged from 1" to 2½" and necessitated removing ⅛" of hardened stock, with 0.003" left for grinding.

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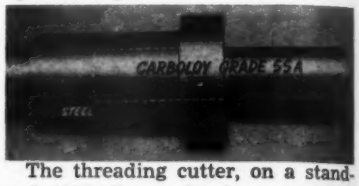

The threading cutter, on a standard 1½" dia steel arbor, overhung the machine by 4¾", with the steel arbor deflected under load when the machine was in operation. The resultant chatter was so violent that many of the API couplings were scrapped and machine noise was excessive.

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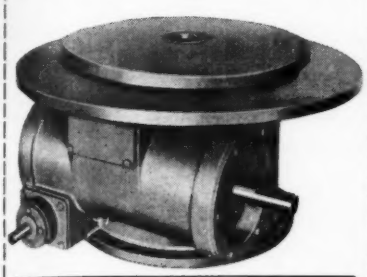

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The number of subjects in which T&P's editors present material in just a few issues adds up very rapidly. Most articles are of lasting interest and have future reference value in solving tooling and production problems.

This cumulative index will build up progressively during each calendar year. Each issue will carry a cumulative index of material contained in all previous issues of the same year, with each January issue carrying the complete index of the twelve issues of the previous year.

We suggest you see to it that your copies of T&P are retained for future reference so you can get the full benefit of this new, unique and useful index.

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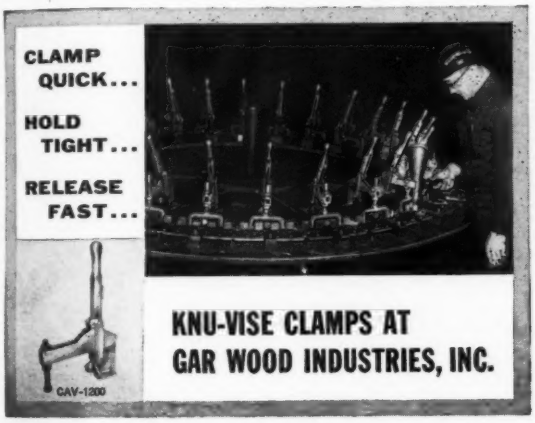

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Contour Checking Fixtures for Precision Bent Stainless Tubing

Fig. 1. Pre-positioning channels, shown here mounted on a 6′ x 11′ table, that make up the adjustable universal fixture for checking the specified length, U-bend, alignment, concentricity, and contour of bent stainless tubing.

Stainless steel tubing for heat exchangers, precision aircraft lines, and other critical applications has to be bent and fabricated to exacting tolerances.

Kreisler Industrial Corp., Division of Jacques Kreisler Manufacturing Corp., has developed some unusual means for checking the dimensional accuracies of both U-bend and irregular contoured tubing. The photographs show two unique fixtures used with other standard test equipment to inspect the bends made in a recent run of Carpenter welded stainless tubing.

Figures 1 and 2 show an adjustable universal contour checking fixture for U-bends. It checks for length, bend, alignment, concentricity and contour fit in accordance with customer specifications. In addition to overall contour, the operator also checks the OD and quality.

The contoured tubing comes off the bending machine, adjacent to this table, and is fixed in several prepositioned channels. The channels are movable laterally to accommodate different size bends. All envelope tolerances are set up by the width and depth of the channel.

Any length and any diameter tube can be inspected with this fixture. Standard table size is 6′ by 11′. Kreisler can handle bends ranging from 1½″ to 24⅜″ radius, and even larger with a bigger table.

Fig. 3. Standards, adjustable for angle and height, serve as a universal checking fixture for inspecting contours of tube assemblies to tolerances of ± 0.0001″. A standard is used at each check point established for inspecting end and tangent points along the bend contour.

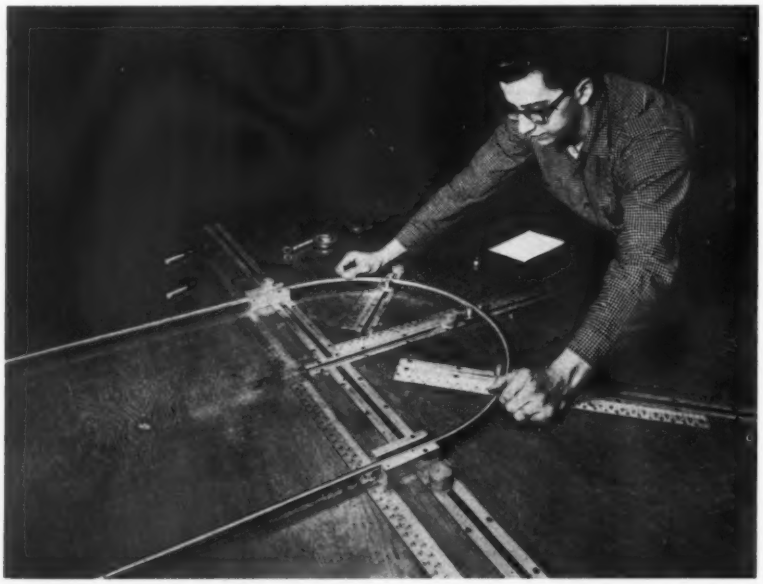

Fig. 2. Close-up of positioning channels arranged for checking the dimensional accuracies of a U-bend in stainless tubing.

The universal checking fixture shown in Figure 3 is used to inspect the contours of custom made tube assemblies to tolerances of ±0.0001″. All coordinate dimensions are computed with electric calculators and checked with a vernier height gage on this table layout.

Check points are established for inspecting all end points and tangent points along the bend contour. Sometimes 48 to 50 standards are required to check a complicated contour with many bends. Each standard is adjustable for angle and height. end

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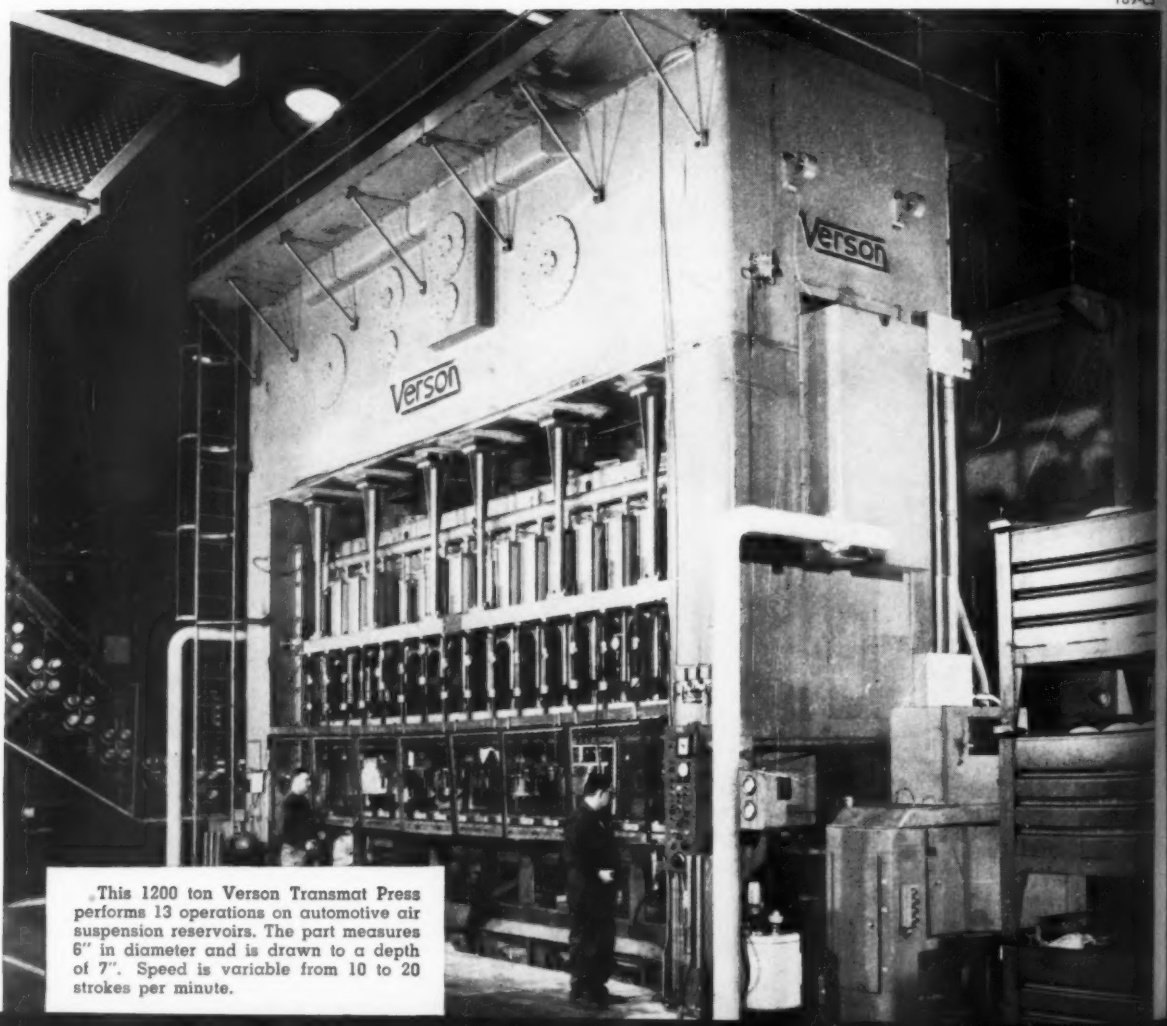

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